London Hydro Inc.

Request for Proposal
for
Advanced Metering Infrastructure (AMI) - Phase I Smartmeter Deployment

August 14, 2007

London Hydro Inc.
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N6A 2T7

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1. PURPOSE OF THIS REQUEST FOR PROPOSAL

1.1 General Intention

Through this Request for Proposal (RFP), London Hydro Inc solicits proposals for an Advanced Metering Infrastructure (AMI) System from interested and qualified bidders. London Hydro wishes to procure an AMI System including electric meters from a qualified bidder at a firm, fixed price, to be used to support two utility services: electricity and domestic water. London Hydro requires a system that is being used by other utilities on an operational basis.

The focus of this project is four-fold:

- the deployment of Smart-meters in several small geographic areas that collectively represent diverse service conditions within London Hydro's franchise service territory;
- the demonstration of an AMI system that can effectively leverage the investment in Smart-metering technology with a suite of value-added functions that provide increased operational effectiveness, improved customer service, or both, in a manner that meets or exceeds the performance criteria as specified, claimed or advertised;
- the demonstration of inter-operability at all levels, and the seamless integration of the AMI with London Hydro's corporate computer systems; and
- the development or refinement of work procedures and supporting tools and processes and umbrella project management techniques that will be required for mass deployments of Smart-meters.

London Hydro wishes to use the AMI system as a catalyst for achieving operational gains and improved customer service, but recognizes that historically the state-of-the-art in automated meter reading has seriously lagged other utility automation systems. As such, if (in London Hydro's opinion) the proposed technologies aren't sufficiently advanced to support the overall goal, London Hydro reserves the right to advise the government of its findings in this regard and simply procure a stripped-down AMI system that only meets the government's base-line requirements.

1.2 Multiple Awards

It is contemplated and preferred that a single award be made to a brand name manufacturer. However, multiple awards may be made as a result of proposals received from this RFP.

London Hydro is aware that there are a number of emerging technologies that may offer increased security, improved reliability, greater functionality, and easier system integration at potentially lower costs utilizing an "open standards" approach.

London Hydro further understands that some of these vendors may be automatically disqualified from responding to an RFP in the Province of Ontario due to clause 2.12, *Proven Technology*, within Ontario Regulation 425/06, *Criteria and Requirements for Meters and Metering Equipment, Systems and Technology*.[1]

In issuing this RFP, London Hydro hopes to encourage all vendors to respond, including those that do not comply with the *Proven Technology* clause.

If after reviewing a response London Hydro determines, in its sole discretion, that a non-compliant vendor(s) technology is superior to another compliant vendor then as a preliminary step London Hydro may choose to conduct one or more pilot projects with the intended purpose to assist the selected vendor(s) in achieving compliance with the Government regulation.

1.3 Governing Principle

This RFP process is intended to conform to the Ontario Ministry of Energy's instructions as set forth in Section 2, *Procurement*, of Ontario Regulation 427/06 made under the *Electricity Act, 1998*, entitled: *Smart Meters: Discretionary Metering Activity and Procurement Principles*.[2]

Note: Although neither London Hydro nor any members of the Smart-Meter purchasing consortium are presently "named" in Ontario Regulation 427/06, the letter received from the Minister of Energy and included herein as Appendix B.2 for convenience of reference indicates the Ministry's intent to amend the Regulation to name the consortium.

1.4 Other Guiding Principles

It is not intended that this RFP restrict bidder's ideas, inventions, advances in the state of the art, or technological improvement, and therefore all bids will be given careful consideration. It must be noted, however, that London Hydro requires sufficient explanations and descriptions to be able to make good value judgment.

[1] Ontario Regulation 425/06 entitled "*Criteria and Requirements for Meters and Metering Equipment, Systems and Technology*" available in electronic format from Ontario Ministry of Energy website at URL: http://www.energy.gov.on.ca/index.cfm?fuseaction=electricity.regulations

[2] Ontario Regulation 427/06 entitled "*Smart Meters: Discretionary Metering Activity and Procurement Principles*" available in electronic format from Ontario Ministry of Energy website at URL: http://www.energy.gov.on.ca/index.cfm?fuseaction=electricity.regulations

2. INTRODUCTION

2.1 Provincial Context for Project

To create a conservation culture in Ontario and make the Province a North American leader in energy efficiency, the Government has taken action to facilitate a number of key initiatives, including:

- The introduction of flexible, time-of-use pricing for electricity;
- A targeted reduction in Ontario's energy consumption by five percent by 2007;
- A commitment to install a smart electricity meter in 800,000 homes and small businesses by 2007 and throughout Ontario by 2010; and
- The passage of legislation to enable implementation of its smart metering initiative and conservation targets.

The smart metering system includes an *Advanced Metering Infrastructure* (AMI) and *Meter Data Management / Repository* (MDM/R) functions. An AMI is the infrastructure within which date- and time-stamped hourly meter reads will be remotely collected and transmitted daily to a utility's control computer and, eventually, to a centralized MDM/R.

The role of the MDM/R is to provide a common infrastructure for receiving meter reads from all AMI in Ontario, processing the reads to produce rate-ready consumption data (that is, data to support billing), storing and managing data, and providing access to such data to Interested Parties.

Note: The *Energy Conservation Responsibility Act, 2006*, sets out the broad purposes and objectives for MDM/R.

The Ontario Ministry of Energy has an expressed interest in promoting Smart-meter procurement effectiveness via the formation of regional LDC buying groups (where possible and practical). The results of this RFP, including vendor selection list, pricing terms, specifications and service terms will be made available to all Ontario LDC's in accordance with the Ministry of Energy's expressed interest in promoting LDC buying groups and cost effectiveness.

2.2 Local Context for Project

London Hydro Inc provides electric service to some 135,000 residential, commercial and industrial customers within its franchise service territory that is 422 square kilometers in area. Further, London Hydro reads and bills some 102,300 water meters on behalf of the City of London.

Note: The difference between the number of electric and water accounts is mostly attributable to apartment buildings and commercial buildings with individual tenant electric metering but bulk water metering.

London Hydro is requesting proposals for an automated meter reading system (referred to herein as Advanced Metering Infrastructure, or AMI) to read electric revenue meters in an automated and cost effective manner. Future migration to technologies for reading water meters and demand response / load management functions is desired.

2.3 Informal Regional Smart-Meter Purchasing Consortium

Although not mandated to proceed with Smartmeter deployments at this time, several neighbouring LDC's have expressed interest in the efficiencies of a common RFP document, and streamlining the proposal evaluation process via some type of informal participation arrangement with London Hydro. The LDC's in question are listed below (along with an indication of the number of residential customers within their respective franchise service territories):

- Bluewater Power, Sarnia.....(31,000 residential customers)
- Cambridge & North Dumfries Hydro Inc.....(42,800 residential customers)
- Erie-Thames Powerlines, Ingersoll.....(13,000 residential customers)
- ENWIN Utilities, Windsor.....(80,000 residential customers)
- Festival Hydro, Stratford .....(18,000 residential customers)
- Guelph Hydro Electric Systems.....(42,000 residential customers)
- Kitchener-Wilmot Hydro Inc.....(71,000 residential customers)
- St. Thomas Energy, St. Thomas.....(13,800 residential customers)
- Tillsonburg Hydro Inc.....(5,400 residential customers)
- Waterloo North Hydro, Waterloo .....(46,000 residential customers)
- West Coast Huron Energy Inc, Goderich .....(3,500 residential customers)
- Woodstock Hydro Services Inc .....(12,500 residential customers)
- Oakville Hydro Inc. .....(47,250 residential customers)
- Peterborough Distribution Inc.....(29,240 residential customers)
- Greater Sudbury Utilities .....(41,000 residential customers)
- Atikokan Hydro Inc .....(1,470 residential customers)
- Fort Frances Power Corporation.....(3,400 residential customers)
- Kenora Hydro Electric Corporation Ltd .....(5,000 residential customers)
- Sioux Lookout Hydro Inc. .....(2,290 residential customers)

- Thunder Bay Hydro .....(44,600 residential customers)

It is envisioned that the listed consortium LDC's would have access to the submitted proposals, would have active standing on the proposal evaluation committee, and could elect to independently procure AMI solutions based on this process.

Each consortium member would place its own individual order, and would have responsibility to receive, inspect, accept, and pay for its own individual orders. Unless otherwise noted, whatever price is stated in the bidder's proposal shall apply across the board to all members of the above-named consortium.

2.4 Accredited Electric Meter Verifier Status

London Hydro's electric meter shop has a quality management system that is jointly registered by Quasar to the ISO-9001:2000 quality model, and accredited by Measurement Canada to their standard S-A-01:2006, *Criteria for the Accreditation of Organizations to Perform Inspections Pursuant to the Electricity and Gas Inspection Act and the Weights and Measures Act*. As such, London Hydro verifies and seals electric revenue meters on behalf of the federal government both for itself and neighbouring LDC's. London Hydro's certificate number is #A-040.

When London Hydro procures new electric meters, it is normal practice to request pricing and delivery for both *sealed* and *unsealed* meters – the actual procurement determination is then based on the price differential, differences in product delivery, and various internal considerations (e.g. London Hydro's internal sealing costs, forecast workload, project needs, etc.).

If the Smartmeter product selected under this RFP is not presently within London Hydro's scope of accreditation, London Hydro will work with the meter manufacturer (as a project outside of the RFP) to expand its scope of accreditation to include the subject revenue meter. The same will be true if one of London Hydro's AMV clients selects a Smartmeter unit not presently within London Hydro's scope of accreditation.

2.5 Municipal Broadband Wireless Mesh Network

The City of London is interested in extending its corporate network via a secure and reliable broadband wireless mesh network to support a large number of municipal government business applications, such as public safety, utility management (e.g. Smart-Bus), code enforcement, asset management, etc.

Similarly, London Hydro and Hydro One Networks (the LDC that entirely surrounds London Hydro's franchise service territory) have emerging requirements for communications infrastructure to support mobile computing, smart-metering, etc.

To this end, throughout the first half of 2006, the three (3) parties engaged in technology discussions and carried out "*proof of concept*" trials using both WiFi and WiMAX technologies in the core area of the city. The trials were of immense value in that they highlighted the technology shortcomings and critical design issues for

deployment. In spite of media hype, it is not the panacea that will satisfy all the needs of all participants.

As a next logical step in the process, a consultant (IBM Canada) has been engaged to review the specific business needs of the various municipal agencies (within the logical network groupings of fixed, nomadic and mobile), the findings from the proof of concept trials, the emerging technologies and standards, and then prepare a technology roadmap (that may consider a mix of public carrier and private municipal systems) and preliminary cost estimate to proceed with the recommended approach (if any).

If the proposed strategy is embraced by the stakeholders and there is an eventual roll-out of the recommended solution, then there needs to be a migration option within the bidder's regional collector to connect to a WiMAX broadband wireless metropolitan area network (with interfaces that conform to the IEEE 802.16 or 802.20 family of standards, and likely using new and emerging spectrum) for backhaul to the AMI master control computer system.

2.6 Public Wireless Communications Carriers as a WAN Option

For bidders proposing a wireless wide area network component (i.e. the interconnection between the regional collector and AMI master control computer), the public wireless communications carriers with a presence in London are listed below (along with contact information):

- Bell Mobility ..... (Blair Collett, Account Executive; ☎ 519-675-1140)
- Rogers Wireless ..... (David Anthony, Account Manager; ☎ 519-852-4848)
- TELUS Mobility ..... (Scott Parsons, Sales Manager; ☎ 519-521-1599)

London Hydro has no information available with respect to each carrier's coverage or susceptibility to interrupted service due to service interruptions on London Hydro's electrical distribution system.

Bidders proposing a public wireless WAN shall be responsible for providing the public carrier(s) with realistic information regarding the distribution of regional data collectors throughout London Hydro's service territory, the network data communications traffic profile (given that the data traffic is likely intermittent, with peak periods and data bursts), and the required throughput requirements to meet the system response requirements given herein.

Note: London Hydro's expectation is that the bid submission will include a separate section with costing information (activation charges, monthly fixed costs, monthly variable costs, etc.) from one or more public wireless carriers that is sufficiently comprehensive that London Hydro could reasonably calculate its anticipated annual operating cost for Group I deployments, Group II deployments, and a complete system deployment.

2.7 Glossary of Terms

The definitions of terms contained in this RFP are not intended to embrace all legitimate meanings of the terms. They are applicable only to the subject treated in this RFP.

2.7.1 AMI Terminology

For the Ministry of Energy's definitions of *Advanced Metering Infrastructure (AMI)* terms refer to Section 3, *Definitions*, of their publication *Functional Specification for an Advanced Metering Infrastructure* – included herein as Appendix B for convenience of reference.

2.7.2 Other Terms

Other terms used in this RFP shall have the following meanings:

Acceptance shall mean the Equipment / Service has passed its Acceptance Testing and shall be formalized in a written notice from Purchaser to Contractor;

Acceptance Testing shall mean the process for ascertaining that the Equipment meets the standards set forth in the section titled *AMI System Requirements* prior to Acceptance by the Purchaser.

Access Broadband Over Power Line (Access BPL) shall mean a carrier current system installed and operated on an electric utility service as an unintentional radiator that sends radio frequency energy on frequencies between 1.705 MHz and 80 MHz over medium voltage lines or low voltage lines to provide broadband communications and is located on the supply side of the utility service's points of interconnection with customer premises. Access BPL does not include power line carrier systems or in-house BPL systems.

Best Value is the basis for awarding all service and technology contracts to the bidder which optimizes quality, cost and efficiency, among responsive and responsible bidders. Such basis shall be, wherever possible, quantifiable.

Bidder shall mean one who submits a response to an Invitation to Bid, specifically this RFP.

Contract shall mean the RFP, the Response, Contract document, all schedules and exhibits and all amendments awarded pursuant to this RFP.

Contractor shall mean the person or business unit actually performing services, or manufacturing, producing, or shipping supplies required by the Contract.

Costs *and* ***Price***. "Costs" in the case of "best value" are distinguished from "price." Costs include conversion costs, life-cycle costs, etc. and *embody* price, which is the amount charged by the bidder for the given commodity or service.

Equipment shall mean the items needed to perform the requirements specified in the RFP, such as AMI hardware/software requirements, software interfaces, and support and component parts within the scope of the solicitation. This includes electric

revenue meters, AMCC devices included in electric meters, AMI communication infrastructure components and systems, computing and communication systems and devices for gathering and processing AMI data, communication components, jumpers, bonding, surge protection devices, grounding, cabling, conduit, wire mould, AMI boxes, outlet boxes, outlets and faceplates, and miscellaneous support products.

Installation shall mean the placement of the AMI systems infrastructure; wiring, communications, software loading and interfacing all necessary internal wiring and associated Equipment to support the integrity and operation of the AMI system

Maintenance shall mean any activity such as test, measurement, replacement, adjustments or repairs, intended to eliminate faults or keep equipment functioning in compliance with the manufacturer's specifications and the requirements of this RFP.

Project shall mean a specific defined task as described in this RFP. A project usually has a specific begin date and end date, specific objectives and specific resources assigned to perform the work.

Power Line Carrier (PLC) shall mean the simultaneous utilization of electricity wires for transmitting narrowband communication signals and power. The lower frequencies and transmitting at slower speed transmissions (in comparison to *Access BPL*) is useful for simple applications such as hot water tariff switching, alarm systems and electricity system monitoring.

Response shall mean the written proposal submitted by Bidder to London Hydro in accordance with this RFP. The Response shall include all written material submitted by Bidder as of the date set forth in the RFP Calendar of Events or as further requested by London Hydro.

Subcontractor shall mean one not in the employ of the successful Bidder, who is providing all or part of the Equipment and/or Services under the resulting Master Contract under separate contract with the successful bidder. The term "subcontractor" means Subcontractor(s) of any tier.

3. CALENDAR OF EVENTS

• Issuance of RFP	**August 15th, 2007**
• Submit Notice of Intent to Propose	**September 12th, 2007**
• Bidders Conference	**September 19th, 2007**
• Deadline for Submission of Questions	**October 5th, 2007**
• Proposal Due Date	**October 24th, 2007 by 3:00 PM**

4. CONTACT INFORMATION

Any bidder in doubt as to the true meaning of any part of the RFP, or other proposed contract documents, or finds discrepancies in, or omissions from the RFP, is instructed to use one of the contact mechanisms described below to request and interpretation or correction thereof.

4.1 Contact for Contractual Matters

The person to contact concerning contractual matters pertaining to this Request for Proposal is:

Mr. Tom Beacock, Purchasing Coordinator

London Hydro Inc.
P.O. Box 2700
111 Horton Street
London, Ontario
N6A 2T7

Telephone: (519) 661-5800 Ext 4775
Facsimile: (519) 661-5865
E-Mail: beacockt@londonhydro.com

4.2 Contact for Technical Matters

The person to contact concerning technical matters pertaining to this Request for Proposal is:

Mr. Joe Lee, P.Eng. Manager of Metering Technologies

London Hydro Inc.
P.O. Box 2700
111 Horton Street
London, Ontario
N6A 2T7

Telephone: (519) 661-5800 Ext 4519
Facsimile: (519) 661-5275
E-Mail: leej@londonhydro.com

4.3 Bidders Conference

London Hydro will host a Bidders Conference for this RFP. The Bidders Conference will be located at London Hydro's offices at 111 Horton Street, London, Ontario at 10:00 AM on the date established in Section 3, *Calendar of Events* (on page 9 herein). Those planning to attend the Bidders Conference are encouraged to provide notification in writing of your intent to attend via the above fax number indicating the names, titles and contact information of the attendees.

Bidders are not required to participate in the Bidders Conference in order to be eligible to submit a proposal. The purpose of the conference is to answer questions potential Bidders may have regarding the solicitation document and to discuss and clarify any issues. This is an opportunity for Bidders to raise concerns regarding specification, terms, conditions, and any requirements of this solicitation. Failure to raise concerns over any issues at this opportunity will be a consideration in any protest filed regarding such items that were known as of this pre-proposal conference.

4.4 Requests for Clarification or Additional Information

Questions regarding clarification of the contents of the Specifications will be accepted from the time of receipt of this document until the date established in Section 3, *Calendar of Events* (on page 9 herein). After this date, London Hydro cannot guarantee that responses will be completed in time before the due date. Questions must be sent in writing, e-mailed or faxed to the appropriate contact as given in Section 4.1 or Section 4.2 above. London Hydro will respond to the questions via addendum.

It is essential that all requests for additional information or clarification of information in the Specification document include:

- The company name
- Contact person's name and title
- Contact person's business address and phone number
- Clear and concise question(s)
- References to specific points within the Specifications.

4.5 Other Restrictions and Grounds for Disqualification

No verbal or written information, which is obtained other than through this RFP or its addenda, shall be binding on London Hydro. No employee of London Hydro is authorized to interpret any portion of this RFP or give information as to the requirements of this RFP in addition to that contained in or amended to this written RFP document except as set forth above.

In addition to the restrictions set forth above, any contact, beyond that allowed in this RFP, with London Hydro Board members, staff or London Hydro's consultants during the period of this RFP may be grounds for disqualification from the RFP process.

5. PROJECT OVERVIEW

The entire Smart-meter project will be carried out in at least three phases. This procurement is for Phase I only. Based on the success of Phase I, the contract with the successful bidder may be extended to encompass the Phase II works described herein. Phases III and beyond will be conducted separately at a later date.

5.1 Phase I Smartmeter Deployments

In Phase I, London Hydro will acquire and install a developed software and hardware solution capable of supporting at least 200,000 points, and initialize the system with 5,067 electric meters and up to 170 water meter interface units purchased from the successful bidder and installed by London Hydro (undoubtedly with the assistance of contractors) at the locations identified in the subsections below.

Note: It is strongly suggested that bidders use the Phase I deployments to demonstrate the maximum extent of interoperability offered by their respective system. For example, within one of the regional collector zones, the successful bidder may choose to deploy revenue meters from several manufacturers.

Note: For the Phase I meter installations, London Hydro intends to continue manually reading the subject meters on a monthly basis until completion of the AMI Acceptance Testing phase (as described in Section 6.6 herein).

5.1.1 Apartment Buildings with Individual Tenant Metering

Within apartment buildings having individual tenant metering, there is generally a polyphase transformer-rated revenue meter for the so-called house service, and electrical closets on every third floor with metered load centers into which a number of self-contained network meters are plugged. The house service meter is generally installed within a painted-steel remote metering cabinet measuring 36” W x 36” H x 12” D in close proximity to the customer’s service entrance switchgear.

The planned Phase I deployments of Smartmeters in multi-metered apartment building are tabulated below and organized alphabetically by municipal address:

Table 5-1, Phase I Apartment Building Deployments

Municipal Address of Apartment Building	Number of Network Meters	Number of 3Ø House Meters	Meter Seal Expiry Year	Number of Water Meters
1600 Adelaide Street	118	1	2009	1
152 Albert Street	24	1	2008	1
1275 Bentley Drive	28	1	2008	1
323 Colborne Street	147	1	2009	1
340 Colborne Street	132	1	2008	1
363 Colborne Street	147	1	2008	1
597 Cranbrook Road	26	1	2008	1
607 Cranbrook Road	26	1	2008	1

274 Dundas Street	23	1	2007	1
626 First Street	27	1	2010	1
1445 Huron Street	29	1	2008	1
986 Huron Street	78	1	2008	1
1096 Jalna Boulevard	144	1	2008	1
300 North Centre Road	119	1	2008	1
22 Picton Street	130	1	2007	1
45 Pond Mills Road	222	1	2010	1
1510 Richmond Street	100	1	2010	1
1580 Richmond Street	29	1	2008	1
675 Richmond Street	187	1	2007	1
695 Richmond Street	203	1	2009	1
190 Sarnia Road	12	1	2009	12
200 Sarnia Road	33	1	2009	1
217 Sarnia Road	57	1	2009	1
198 Springbank Drive	128	1	2008	1
600 Talbot Street	103	1	2008	1
699 Talbot Street	105	1	2007	1
460 Wellington Street	41	1	2008	1
151 York Street	30	1	2009	1
176 York Street	24	1	2008	1
82 York Street	30	1	2009	1
88 York Street	25	1	2009	1
Total Meter Deployments:	2,527	31		42

The locations of the listed apartment buildings can be found on the City of London's interactive maps at URL: http://www.city.london.on.ca/_private/Maps/Maps.htm

5.1.2 Townhouse Developments with Load-Shifting Opportunities

There are four (4) townhouse developments operated by London Middlesex Housing Corporation that have opportunities for installation of energy conservation measures (e.g. gray-water heat recovery units) and load-shifting operation of their electric storage tank water heaters. This fulfills London Hydro's energy conservation and demand-side management objectives, allows LMHC to again demonstrate leadership on the energy conservation front, and with a Smart-meter installed will result in appreciable energy cost savings to the tenants. The 523 units in question are identified below:

- 979-1167 Huron Street - 110 water heaters;
- 1481 Limberlost Road - 160 water heaters;
- 370 Pond Mills Road - 81 water heaters; and
- 931-1225 Southdale Road - 172 water heaters.

Site plans for the 523 smartmeter installations are provided below in Figure 5-1 through to Figure 5-4 respectively.

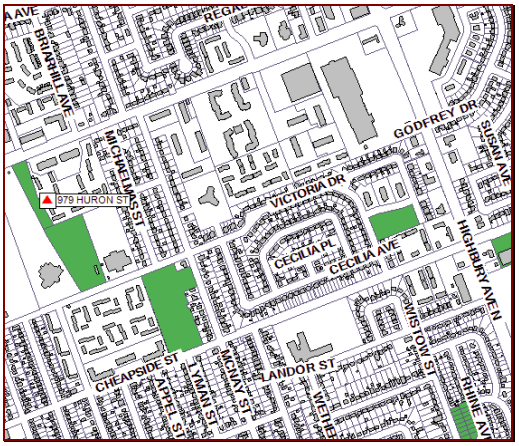


Figure 5-1, Townhouse Complex at 979 - 1167 Huron Street

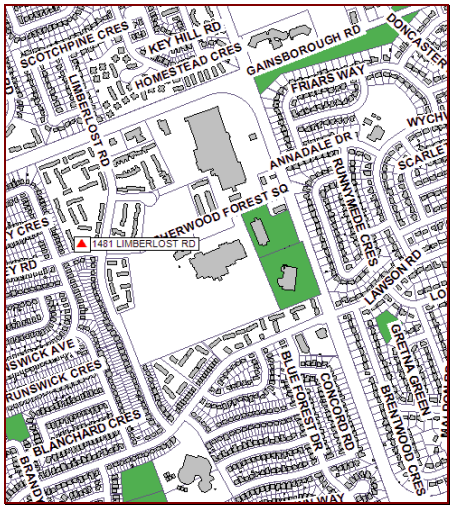


Figure 5-2, Townhouse Complex at 1481 Limberlost Road

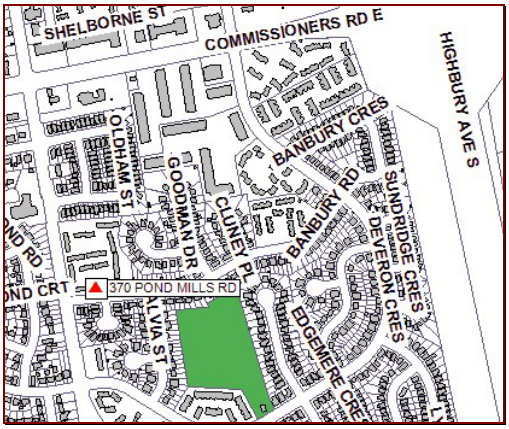


Figure 5-3, Townhouse Complex at 370 Pond Mills Road

Figure 5-4, Townhouse Complex at 931 - 1225 Southdale Road East

All electric meters are single-phase, self-contained, socket-style units installed in meter bases mounted on external building walls.

5.1.3 Residential Area with Hard-to-Read Meters

5.1.3.1 Representative Residential Block within Old South

With early residential distribution systems, the revenue meter was installed indoors adjacent the main service panel (electrically downstream of the main service disconnect) in the basement. In recent decades, the standard has been outdoor single-phase meters (electrically located upstream of the customer's main service disconnect).

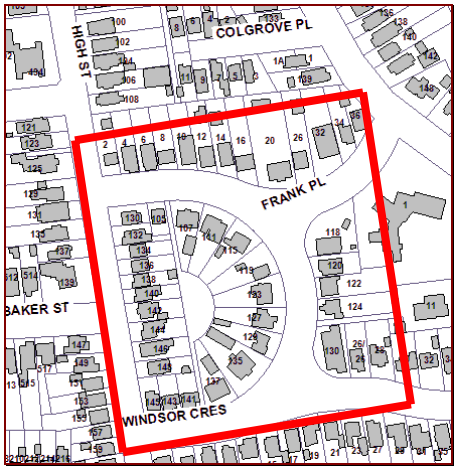


Figure 5-5, Indoor Meters on Windsor Crescent & High Street

This particular pocket of homes, located along High Street and Windsor Crescent, is representative of many areas of vintage housing, namely a mix of indoor revenue meters and outdoor meters (the latter resulting from renovations or electrical upgrades within the subject home).

Outfitting the homes on the north side of Frank Place, within the "D" formed by High Street and Windsor Crescent, and on the north side of Foxbar Road, as depicted in Figure 5-5 above, should be sufficient to demonstrate the suitability of the AMI system to access indoor meters. Forty-seven (47) single-phase, self-contained, socket-style Smartmeters will be required for this deployment.

5.1.3.2 Berkshire / Gardenwood Subsurface Electrical Room

In the vicinity of Berkshire Drive, Gardenwood Drive, and Southcrest Drive, there are eight (8) townhouse developments, as depicted in Figure 5-6 below, wherein the electric meters and water meters for each building are located in a subsurface electrical room as depicted in Figure 5-7 below.

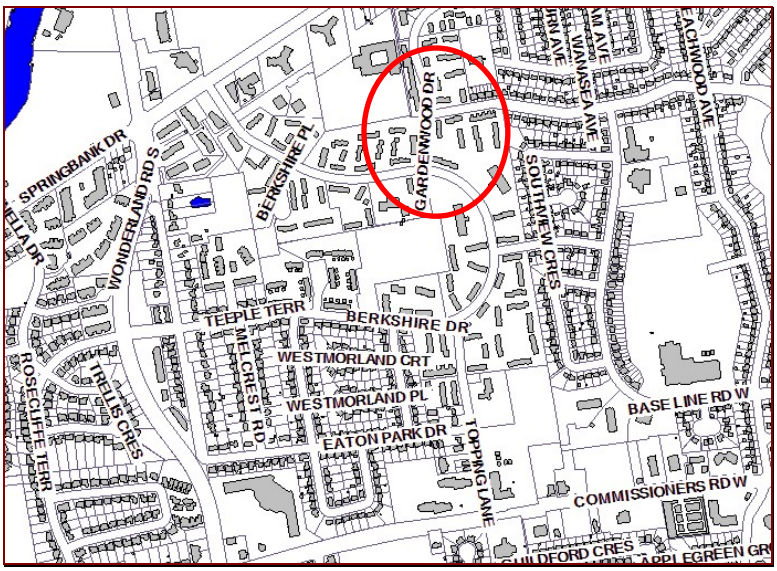


Figure 5-6, Location of Townhouses with Subsurface Vaults

Figure 5-7, Typical Arrangement of Subsurface Electrical Room

The access ladder-ways to these vintage subsurface electrical rooms have been identified as being problematic from the perspective of slip and fall prevention. As such, there is some urgency to replace the electric and water meters with units suitable for automated meter reading.

In total, there are one-hundred and twenty (120) single-phase electric meters and fifteen (15) water meters associated with this Smartmeter deployment.

5.1.4 Expired 600 V Delta Meters in Westmount Mall

Westmount Shopping Mall, located at 785 Wonderland Road South, has an internal three-wire 600 V (Δ) distribution system that provides supply to dry-type step-down transformers located within each tenant unit.

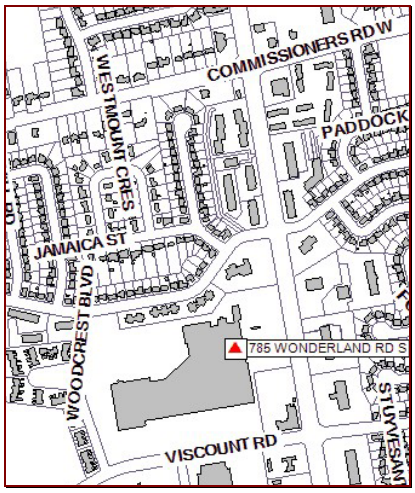


Figure 5-8, Westmount Shopping Mall

The tenant spaces are presently metered via an interconnected network of Carma Industries' *Energy Monitoring Pod (EMP)* devices. Most tenant spaces have a meter socket available (that was intended for installation of a check meter). The plan is to abandon the Carma metering system and install socket-style electric meters in each of the tenant spaces.

In total, there are one-hundred and sixty (160) electric meters and eight (8) water meters associated with this Smartmeter deployment.

5.1.5 Core Area Services Supplied from Network Grid Distribution System

Two (2) multi-tenant buildings in the core area of the city that receive electric supply from London Hydro's 120/208Y V network grid distribution system are 364 Talbot Street (as depicted in Figure 5-9) and 127 King Street (as depicted in Figure 5-10). As is typical, the electric meters are located in the basements of the buildings.

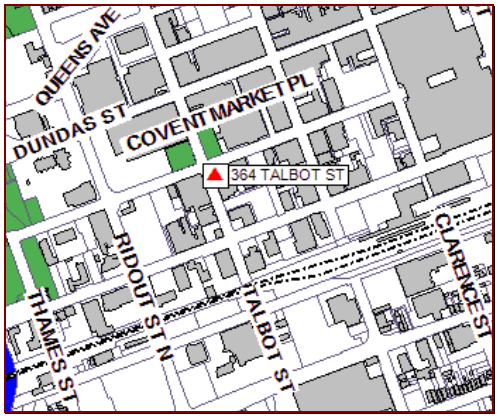


Figure 5-9, Multi-Tenant Building at 364 Talbot Street

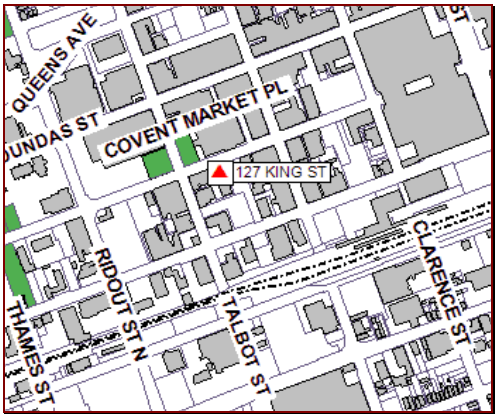


Figure 5-10, Multi-Tenant Building at 127 King Street

There are presently sixteen (16) electric meters and no (0) water meters installed at 364 Talbot Street, with electric meter types as follows:

- Seven (7) self-contained network meters; and
- Nine (9) self-contained two-wire 120 V meters.

There are presently eight (8) electric meters and two (2) water meters installed at 127 King Street, with electric meter types as follows:

- Six (6) self-contained network meters;
- One (1) self-contained polyphase meter; and
- One (1) transformer-rated polyphase meter.

In total, there are twenty-four (24) electric meters and three (3) water meters associated with this Smartmeter deployment.

5.1.6 Low-Density Rural Meters

The lands south of Highway 401 within London Hydro's franchise service territory are largely rural (i.e. sparsely populated agricultural lands). This Smartmeter deployment will cover all the farms located along Manning Drive, from Wonderland Road South to the west to Old Victoria Road to the east, as depicted in Figure 5-11 below.

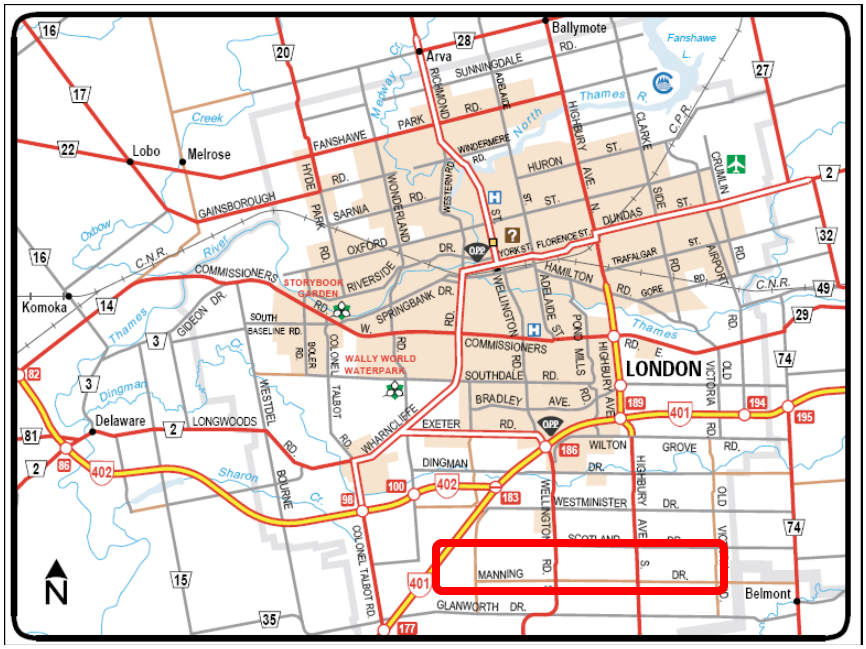


Figure 5-11, Rural Deployment on Manning Drive

The revenue metering requirements for this 11 km stretch are given below:

- Twenty-one (21) self-contained single-phase (Form 2S) electric meters; and
- Ten (10) two-wire transformer-rated (Form 3S) electric meters.

Note: The distance between farms can be scaled from the City of London's online interactive maps system at URL: http://www.city.london.on.ca/_private/Maps/Maps.htm

5.1.7 New Development of EnergyStar Homes

The Cedar Hollow community, planned to consist of 102 residential units, each constructed in accordance with the *ENERGY STAR® for New Homes* criteria, is being developed in the area of Highbury Avenue and Killarney Road (south of Fanshawe Park Road) for Fall 2007 occupancy.

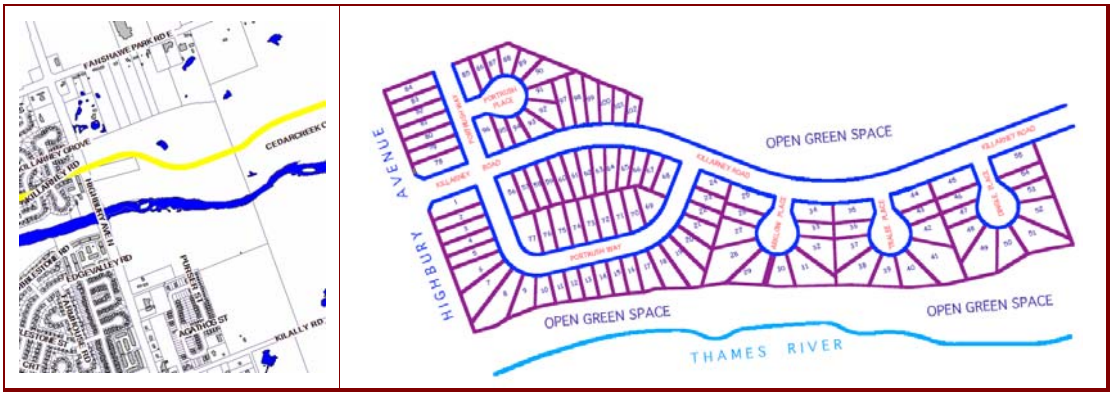


Figure 5-12, Cedar Hollow Community

The developer wishes to include Smartmeters amongst the offered features for these homes. The water meters in these dwellings will also be outfitted with WMTU's (as described in Section 6.2.10.4 herein) for automated reading of water meters.

Note: Within London Hydro, revenue meters for *new services* are handled using different staff and processes than those used for *meter exchanges* (usually due to seal expiry). This limited deployment will be an opportunity for refinement of London Hydro's internal processes (and consequent staff training) in advance of future larger deployments in new subdivisions.

5.1.8 Residential Areas with Voltage Regulation Problems

Within the service territory, there are pockets of residential load, generally located at the end of vintage 2.4/4.16Y kV distribution circuits, with voltage regulation issues – at the start of the air conditioning season, the supply voltage to homes drops well below acceptable levels and customer complaints lead to manual changes to transformer taps. Conversely, at the end of the air conditioning season, customer complaints concerning over-voltage lead to restoration of transformer taps.

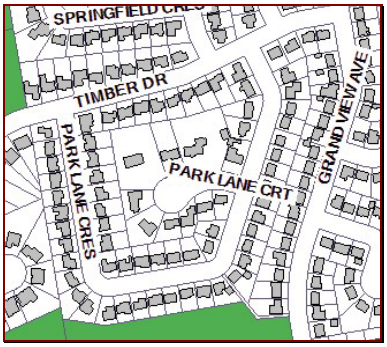


Figure 5-13, Selected Portion of Park Lane Estates Subdivision

One such pocket is Park Lane Estates in the west end of the city. Outfitting the homes on Park Lane Crescent and Park Lane Court, as depicted in Figure 5-13 above, should be sufficient to demonstrate the *Quality of Supply Voltage Reporting* function, as outlined in Section 6.2.9.3 – see page 59 herein. Sixty-four (64) Smartmeters will be required for this deployment.

5.1.9 Free Issue Single-Phase Self-Contained Revenue Meters (2007 Programs)

Every year, London Hydro needs to procure certain volumes of new revenue meters to accommodate new residential developments, to accommodate meter exchanges within compliance sample groups, and to replace meters that are at the end of their useful life.

To accommodate scheduled work for the final four months of 2007, the successful bidder shall supply electric meters for installation throughout the service territory, as follows:

- 750 single-phase self-contained revenue meters for new residential homes;
- 160 single-phase self-contained revenue meters for meter exchanges under compliance sampling programs;
- 28 three-phase self-contained 347/600Y V revenue meters for compliance sample meter exchanges; and
- 500 single-phase self-contained revenue meters for end-of-life replacements.

If by chance some of the subject meters are within range of a regional collector, they will be interconnected with the AMI system; otherwise the subject revenue meters will continue to be manually read until a later phase of the overall project.

5.1.10 Summary of Phase I Smartmeter Deployments

For convenience, the Phase I Smartmeter deployment quantities have been tabulated below:

Table 5-2, Phase I Smartmeter Deployment Summary

Section	Page	Single-Phase Meters	Network Meters	Polyphase Meters	Water Meter Interfaces
5.1.1	12	--	2,527	31	42
5.1.2	13	523	--	--	--
5.1.3.1	15	47	--	--	--
5.1.3.2	15	120	--	--	15
5.1.4	17	--	--	160	8
5.1.5	17	9	13	2	3
5.1.6	18	31	--	--	--
5.1.7	19	102	--	--	102
5.1.8	19	64	--	--	--
5.1.9	20	1,410	--	28	--
		2,306	2,540	221	170

5.2 Phase II Smartmeter Deployments

If the Phase I smart-meter deployment is considered first-rate by London Hydro (and the regulatory environment concerning the Smart-metering initiative remains largely unchanged), then:

- by mutual agreement between the successful bidder and London Hydro, and
- within 365 calendar days of the execution date for the Phase I contract,

the Phase I contract may be extended to encompass the Phase II deployments (or a subset thereof) as outlined in the subsections below.

Note: A first-rate deployment is one whereby in London Hydro's opinion, the product is clearly a state-of-the-art utility-grade product optimized for the application, the successful bidder has extensive experience and expertise with metering, issues are addressed in a professional and timely manner, product support staff are available and effective, the documentation is complete and well-written, and there is clear evidence that the product is continuously being enhanced with new features and expanded functionality (which is very different than frequent updates to address shortcomings and chronic bugs).

5.2.1 Apartment Buildings with Individual Tenant Metering

The planned Phase II deployments of Smartmeters in multi-metered apartment building are tabulated below organized alphabetically by municipal address:

Table 5-3, Phase II Apartment Building Deployments

Municipal Address of Apartment Building	Number of Network Meters	Number of 3Ø House Meters	Meter Seal Expiry Year	Number of Water Meters
380 Adelaide Street	78	1	2010	1
430 Adelaide Street	36	1	2010	1
75 Ann Street	137	1	2011	1
135 Baseline Road	87	1	2010	1
76 Baseline Road	84	1	2010	1
77 Baseline Road	46	1	2010	1
95 Baseline Road	97	1	2010	1
110 Belmont Drive	130	1	2010	1
111 Belmont Drive	91	1	2010	1
127 Belmont Drive	88	1	2010	1
1265 Bentley Drive	30	1	2010	1
390 Burwell Street	90	1	2014	1
30 Chapman Court	118	1	2010	1
650 Cheapside Street	59	1	2010	1
55 Chesterfield Avenue	38	1	2010	1
854 Commissioners Road	110	1	2010	1
858 Commissioners Road	94	1	2010	1
860 Commissioners Road	110	1	2010	1
9 Commissioners Road	136	1	2010	1
1066 Commissioners Road	87	1	2010	1

1180 Commissioners Road	72	1	2010	1
1369 Commissioners Road	55	1	2010	1
1371 Commissioners Road	40	1	2011	1
331 Commissioners Road	87	1	2010	1
333 Commissioners Road	86	1	2010	1
130 Conway Drive	78	1	2010	1
136 Conway Drive	82	1	2010	1
140 Conway Drive	52	1	2010	1
144 Conway Drive	53	1	2010	1
148 Conway Drive	53	1	2010	1
587 Cranbrook Road	26	1	2010	1
725 Deveron Crescent	64	1	2010	1
727 Deveron Crescent	52	1	2010	1
729 Deveron Crescent	29	1	2010	1
731 Deveron Crescent	47	1	2010	1
733 Deveron Crescent	52	1	2010	1
735 Deveron Crescent	53	1	2010	1
737 Deveron Crescent	52	1	2010	1
739 Deveron Crescent	29	1	2010	1
630 Dundas Street	33	1	2010	1
2189 Dundas Street	104	1	2010	1
511 Gainsborough Road	120	1	2010	1
570 Gainsborough Road	66	1	2010	1
600 Grenfell Drive	118	1	2010	1
235 Grey Street	60	1	2010	1
80 Highview Avenue	137	1	2009	1
90 Highview Avenue	137	1	2010	1
1447 Huron Street	30	1	2009	1
75 Huxley Street	41	1	2010	1
1 Jacksway Crescent	86	1	2010	1
15 Jacksway Crescent	86	1	2010	1
5 Jacksway Crescent	86	1	2010	1
9 Jacksway Crescent	73	1	2010	1
1669 Jalna Boulevard	93	1	2010	1
1670 Jalna Boulevard	93	1	2010	1
1671 Jalna Boulevard	81	1	2010	1
155 Kent Street	111	1	2010	1
19 King Street	39	1	2009	1
425 King Street	36	1	2010	1
654 King Street	30	1	2010	1
749 Little Simcoe Street	32	1	2010	1
7 Picton Street	60	1	2009	1
500 Proudfoot Lane	130	1	2010	1
560 Proudfoot Lane	131	1	2010	1

570 Proudfoot Lane	119	1	2010	1
396 Queens Avenue	69	1	2010	1
332 Richmond Street	28	1	2009	1
343 Richmond Street	22	1	2010	1
549 Ridout Street	64	1	2010	1
59 Ridout Street	59	1	2010	1
521 Riverside Drive	96	1	2010	1
450 Sandringham Crescent	100	1	2010	1
440 South Street	40	1	2010	1
250 Sydenham Street	64	1	2010	1
500 Talbot Street	95	1	2010	1
587 Talbot Street	40	1	2010	1
2228 Trafalgar Street	77	1	2010	1
2230 Trafalgar Street	72	1	2010	1
1260 Webster Street	46	1	2010	1
1105 Wellington Road	24	1	2009	1
1083 Western Road	23	1	2010	1
619 William Street	76	1	2010	1
665 Windermere Road	154	1	2010	1
744 Wonderland Road	94	1	2010	1
750 Wonderland Road	143	1	2010	1
800 Wonderland Road	142	1	2010	1
Total Meter Deployments:	6,468	86		86

The locations of the listed apartment buildings can be found on the City of London's interactive maps at URL: http://www.city.london.on.ca/_private/Maps/Maps.htm

5.2.2 Shopping Malls and Other Retail Spaces with Individual Tenant Metering

5.2.2.1 White Oaks Shopping Mall

White Oaks Shopping Centre is located at 1105 Wellington Road, on the south-west corner of Bradley Avenue and Wellington Road, as depicted in Figure 5-14.

A Smartmeter deployment here will involve 176 self-contained polyphase revenue meters (in 120/208Y, 347/600Y and 600Δ V configurations) installed within eleven (11) electrical rooms dispersed throughout the complex.

Note: There are an additional 12 transformer-rated polyphase (energy & demand) revenue meters installed at this site.

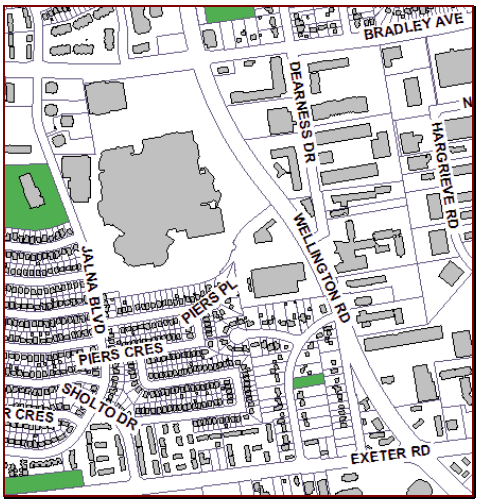


Figure 5-14, White Oaks Shopping Mall

5.2.2.2 Argyle Shopping Mall

Argyle Shopping Centre is located on the south-east corner of Dundas Street and Clarke Road, as depicted in Figure 5-15.

A Smartmeter deployment here will involve 33 self-contained polyphase revenue meters (in 120/208Y and 347/600Y V configurations) installed within six (6) electrical rooms dispersed throughout the complex.

Note: There are an additional 13 transformer-rated polyphase (energy & demand) revenue meters installed at this site.

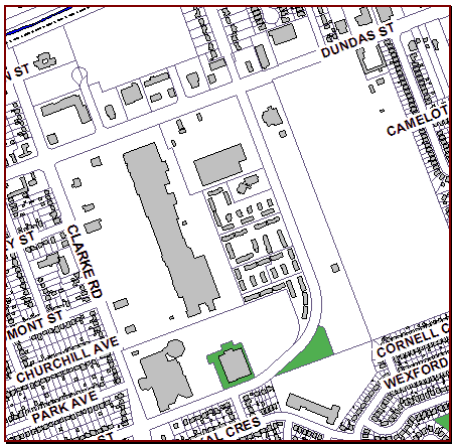


Figure 5-15, Argyle Shopping Mall

5.2.3 Old South Residential Community

The Old South Community is the mostly residential area bounded by the Thames River to the north, Wharncliffe Road to the west, Baseline Road to the south, and the railroad tracks to the east, as depicted in Figure 5-16 below.

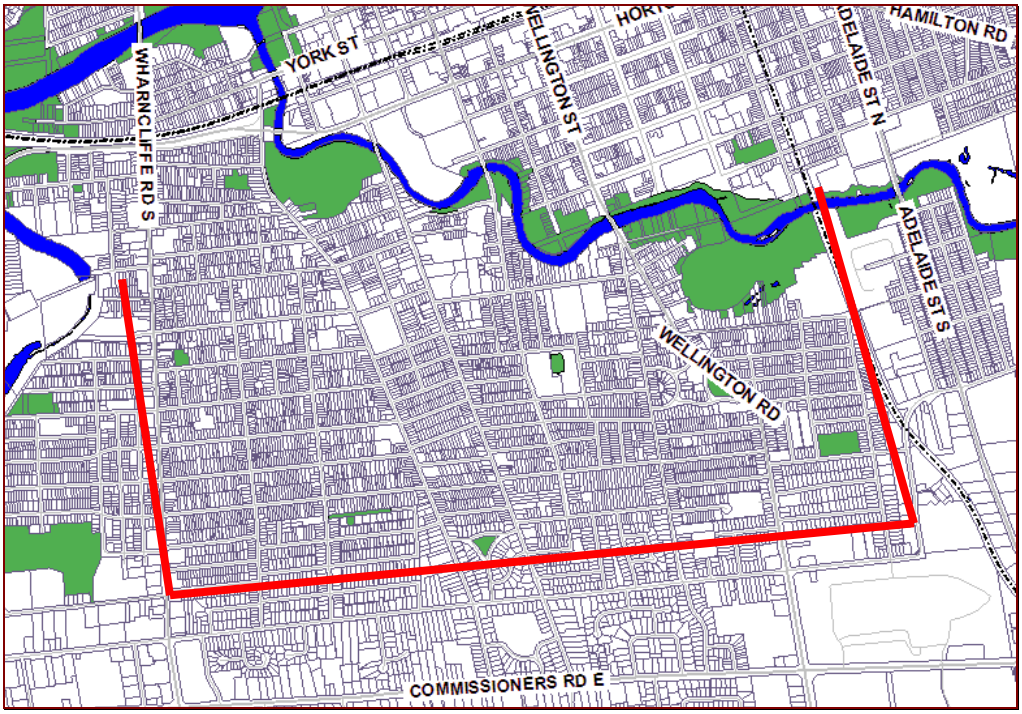


Figure 5-16, Old South Residential Community

Excluding apartment buildings which are covered in Sections 5.1.1 and 5.2.1 and another Phase I deployment covered in Section 5.1.3.1, the electric meter density maps included as Appendix C herein indicate that a full Smartmeter deployment in

this area will involve approximately (3,465 in grid zone P51 + 2/3 of 3,946 in grid zone P50 ≈) 6,100 Smartmeters, the majority of which will be single-phase self-contained revenue meters.

Note: The geographic boundaries of the community as illustrated in Figure 5-16 above don't coincide with the grid boundaries used in the Appendix C meter density maps, and as such, obtaining an accurate meter inventory is not straightforward. However, the purpose here is only to provide bidders with an indication of London Hydro's commitment for Phase II deployments. As part of the negotiations for a contract extension to encompass Phase II deployments, London Hydro will provide a precise inventory of meter quantities and types within the subject deployment area.

5.2.4 Southcrest Residential Community

The Southcrest Community is the mostly residential area bounded by the Thames River to the north, Wonderland Road to the west, Commissioners Road to the south, and Wharncliffe Road to the east, as depicted in Figure 5-17 below.

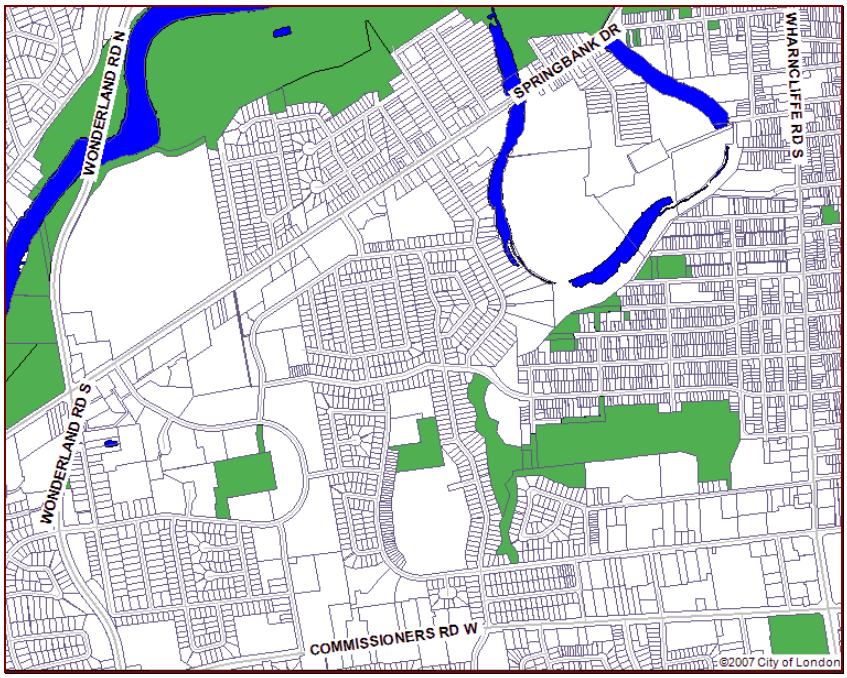


Figure 5-17, Southcrest Residential Community

Excluding apartment buildings which are covered elsewhere (i.e. Sections 5.1.1 and 5.2.1) and the Phase I townhouse deployment (i.e. Section 5.1.3.2), the electric meter density maps included as Appendix C herein indicate that a full Smartmeter deployment in this area will involve approximately (1,191 in grid zone P52 + ½ of 2,173 in grid zone P53 + ½ of 1,219 in grid zone Q52 + ½ of 999 in grid zone Q53 ≈) 3,380 Smartmeters, the majority of which will be single-phase self-contained revenue meters.

Note: The geographic boundaries of the community as illustrated in Figure 5-17 above don't coincide with the grid boundaries used in the Appendix C meter density maps, and as such, obtaining an accurate meter inventory is not straightforward. However, the purpose here is only to provide bidders with an indication of London Hydro's commitment for Phase II

deployments. As part of the negotiations for a contract extension to encompass Phase II deployments, London Hydro will provide a precise inventory of meter quantities and types within the subject deployment area.

5.2.5 Argyle Residential Community

The west portion of Argyle residential community is bounded on the north by Dundas Street, Highbury Avenue to the west, Trafalgar Street to the south, and Clarke Road to the east, as depicted in Figure 5-18 below.

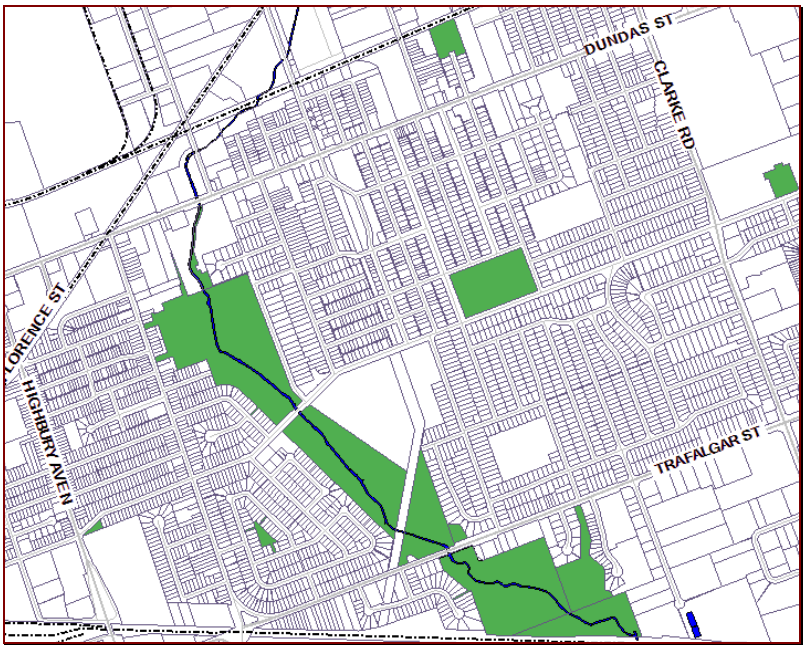


Figure 5-18, Argyle Residential Community (West Portion)

Excluding apartment buildings which are covered elsewhere (i.e. Sections 5.1.1 and 5.2.1), the electric meter density maps included as Appendix C herein indicate that a full Smartmeter deployment in this area will involve approximately (1/4 of 1,224 in grid Q47 + ½ of 1,545 in grid Q46 + ¼ of 1,884 in grid Q45 +1/4 of 2,436 in grid P47 + ½ of 2,051 in grid P46 + ¼ of 1,948 in grid P45 ≈) 3,670 Smartmeters, the majority of which will be single-phase self-contained revenue meters.

Note: The geographic boundaries of the community as illustrated in Figure 5-18 above don't coincide with the grid boundaries used in the Appendix C meter density maps, and as such, obtaining an accurate meter inventory is not straightforward. However, the purpose here is only to provide bidders with an indication of London Hydro's commitment for Phase II deployments. As part of the negotiations for a contract extension to encompass Phase II deployments, London Hydro will provide a precise inventory of meter quantities and types within the subject area.

5.2.6 Westminster Park Community

Westminster Park community is bounded on the north and east by Westminster Ponds, Wellington Road to the west, and Bradley Avenue to the south, as depicted in Figure 5-19 below.

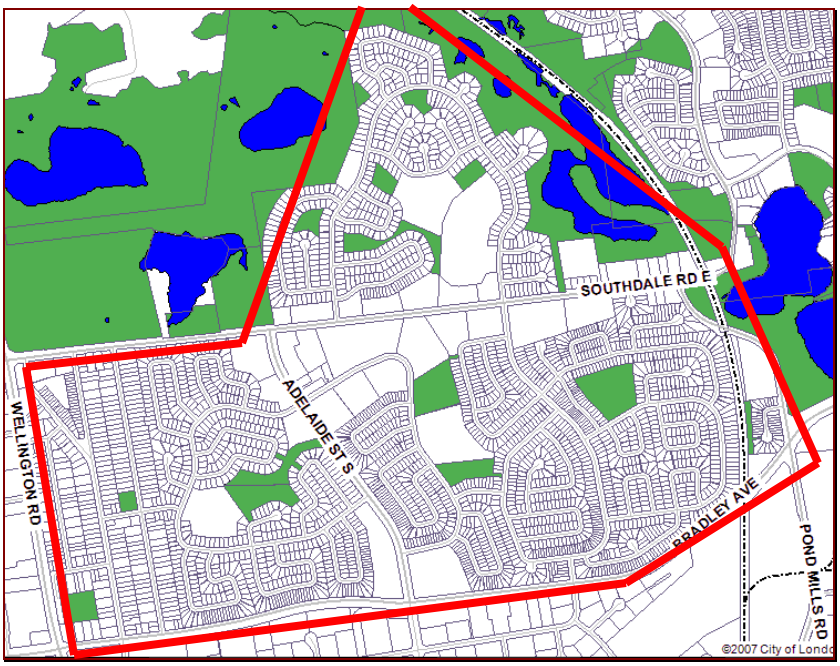


Figure 5-19, Westminster Park Community

Excluding apartment buildings which are covered elsewhere (i.e. Sections 5.1.1 and 5.2.1) and the Phase I townhouse deployment (i.e. Section 5.1.2), the electric meter density maps included as Appendix C herein indicate that a full Smartmeter deployment in this area will involve approximately (1/2 of 1,932 in grid N50 + ½ of 1,971 in grid N49 + 1/3 of 1,354 in grid O49 ≈) 2,400 Smartmeters, the majority of which will be single-phase self-contained revenue meters.

Note: The geographic boundaries of the community as illustrated in Figure 5-19 above don't coincide with the grid boundaries used in the Appendix C meter density maps, and as such, obtaining an accurate meter inventory is not straightforward. However, the purpose here is only to provide bidders with an indication of London Hydro's commitment for Phase II deployments. As part of the negotiations for a contract extension to encompass Phase II deployments, London Hydro will provide a precise inventory of meter quantities and types within the subject area.

5.2.7 Free Issue Self-Contained Revenue Meters (2008 Programs)

Every year, London Hydro needs to procure certain volumes of new revenue meters to accommodate new residential developments, to accommodate meter exchanges within compliance sample groups, and to replace meters that are at the end of their useful life.

To accommodate scheduled work throughout 2008, the successful bidder shall supply electric meters for installation throughout the service territory, as follows:

- 2,000 single-phase self-contained revenue meters for new residential homes;
- 609 single-phase self-contained revenue meters for compliance sample meter exchanges;

- 28 three-phase self-contained 347/600Y V revenue meters for compliance sample meter exchanges; and
- 1,023 single-phase self-contained revenue meters for end-of-life replacements (e.g. CAPAR #47).

If by chance some of the subject meters are within range of a regional collector, they will be interconnected with the AMI system; otherwise the subject revenue meters will continue to be manually read until a later phase of the overall project.

5.2.8 Summary of Phase II Smartmeter Deployments

For convenience, the Phase II Smartmeter deployment quantities have been tabulated below:

Table 5-4, Phase II Smartmeter Deployment Summary

Section	Page	Single-Phase Meters	Network Meters	Polyphase Meters	Water Meter Interfaces
5.2.1	21	--	6,468	86	86
5.2.2.1	23	--	--	176	--
5.2.2.2	24	--	--	33	--
5.2.3	24	6,100	--	--	--
5.2.4	25	3,380	--	--	--
5.2.5	26	3,670	--	--	--
5.2.6	26	2,400	--	--	--
5.2.7	27	3,632	--	28	--
		19,182	6,468	276	86

Note: The revenue meter quantities and types given in Sections 5.2.3 through to 5.2.6 are approximate quantities only based on the revenue meter density maps included in Appendix C. Although the revenue meters for these areas have been categorized as single-phase meters, Table 6-3 on page 39 herein can be used as a proxy of the typical distribution of meter types. Exact meter quantities and types will be defined when (and if) a contract extension covering Phase II is negotiated.

Note: The quantity of water meter interfaces associated with Phase II may be considerably more than as indicated in Table 5-4 above. A decision in this regard will be based on the business case being prepared by a consultant on behalf of the City of London and the success of Phase I water meter interface deployments.

5.3 Optional Supply of Qualified Installation Labour

London Hydro expects to augment its Electric Metering trades staff with qualified contract staff to deploy the Phase I field devices (revenue meters and regional collectors) in an expeditious manner. London Hydro envisions a reporting structure whereby, each of its electric metering journeypersons would temporarily be elevated

to lead-hand status and would be responsible for the quality and quantity of work for a small workgroup of qualified contract staff.

Bidders that can offer qualified installation labour are encouraged to include hourly rates for such resources, as well as timelines for the availability of such resources.

Note: It is essential that contract staff possess working knowledge of the E&USA Safe Practice Guide entitled: "*Low-Voltage Applications*".

Note: Prior to carrying out field installations of revenue meters, contractor labour will need to successfully complete a training session on the applicable work procedures within the Electric Metering Department's Quality Management System, and London Hydro's in-house safety procedures that apply to meter exchanges.

6. AMI SYSTEM REQUIREMENTS

6.1 Overview of Application Environment

6.1.1 Knowledge of Conditions

At the time of submission, each bidder shall be presumed to have satisfied itself with the nature and location of the work, general and local conditions, and to have read and become thoroughly familiar with the specifications.

Bidders shall gain full knowledge of the working conditions and other facilities in the area which will have a bearing on the performance of its work. Any failure by the bidder to acquaint itself with all the available information shall not relieve that bidder from any responsibility for performing all work properly. No additional compensation will be allowed for conditions increasing the bidder's costs which were not known, or appreciated by, that bidder when submitting the proposal.

6.1.2 London Hydro's Franchise Service Territory

London Hydro's franchise service territory, covering an area of 422 square kilometers, is split into three classifications of distribution circuitry as listed below:

- Low-voltage network grid system;
- Urban distribution systems; and
- Rural distribution systems.

The geographic area covered by each of the systems is generally depicted in Figure 6-1 to the right. The rural distribution systems are essentially those within those geographic areas labeled as North Annexed and South Annexed that were annexed from Ontario Hydro Services Company in November 1998. The low-voltage network grid is contained within the Central London planning community and is essentially bounded by Ridout Street to the west, Dufferin Street to the north,

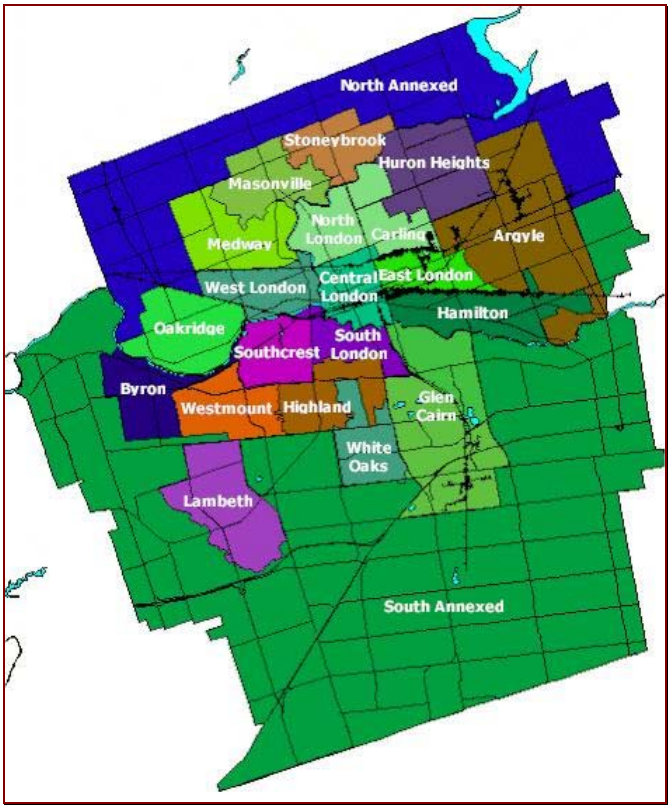


Figure 6-1, Franchise Service Territory For London Hydro

Waterloo Street to the east, and York Street to the south. All other parts of the city are supplied by what is termed urban distribution systems.

Specific features of the service territory (i.e. roadways, rivers, parks, buildings, etc.) can be seen on the City of London's interactive maps at URL: http://www.city.london.on.ca/_private/Maps/Maps.htm

6.1.3 Issues to Consider for Radio Frequency (RF) LAN Offerings

From a wireless perspective, much of London Hydro's service territory is similar to other urban environments which are characterized by an enormous amount of multi-paths and physical obstructions such as buildings. Some of the known radio frequency design challenges are outlined in the subsections below.

6.1.3.1 Installing Regional Collectors / Repeaters on Roadway Lighting Luminaires

Bidders contemplating the installation of regional collectors, RF repeaters, or other system elements on roadway lighting poles, traffic signal poles or electricity distribution poles need to be aware that there are certain challenges that need to be overcome with the first two options as a consequence of regulatory changes over the past decade.

Prior to the provincial *Electricity Competition Act, 1998*, London Hydro was responsible for the design, installation, operation and maintenance of municipal roadway lighting systems. Two standards designs for post-top luminaires, as depicted in Figure 6-2 and Figure 6-3 below, were available to developers for installation in residential subdivisions.

Figure 6-2, Classic Post-Top Luminaire for Residential Subdivisions

Figure 6-3, Decorative Luminaire for Residential Subdivisions

On main thoroughfares throughout the City, roadway lightning was accomplished using the classic cobra-head luminaire and tubular davit arm assembly as depicted in Figure 6-4.

Nowadays, with London Hydro no longer responsible for any aspect of roadway lighting (or traffic signals), the developers have more options for roadway lighting – one such example is depicted in Figure 6-5 below. Note that with this particular luminaire, the photocell control is not visible – it is physically located inside a small window within the base of the lamp.

Figure 6-4, Cobra-Head Luminaire for Main Streets

Figure 6-5, Example of New Type of Residential Subdivision Luminaire

Installation of regional collectors / repeaters on roadway lighting or traffic signal poles, and powering the devices from the photocell receptacle would require joint-use attachment agreements with the City and some cost-sharing arrangement on the 120 V_{ac} supply cables supplying these systems.

Note: Bidders should be aware that for the high-pressure sodium (HPS) lamps used in these luminaires, the normal evidence of end-of-life for the lamp is "cycling", which means the internal electric arc repeatedly extinguishes itself and then re-strikes a few minutes later. Such re-strikes can result in interference to the radio frequency band.

6.1.3.2 RF Absorption Due to Foliage

In deploying wireless systems, reaching the maximum number of end devices (i.e. Smart-meters) with the simplest deployment possible is the ultimate goal. However, the scattering and absorption of radio waves by foliage can create some problems. In the summer, leaves can reduce coverage, and in winter, their absence can free signals to travel farther than they're supposed to.

Residential subdivisions built in London over the past four or five decades are characterized as having winding streets as depicted in Figure 6-6 below. Furthermore, and as depicted in Figure 6-7 below, the tree plantings are inline with the municipal roadway lighting systems, i.e. the tree foliage generally entirely blocks line-of-sight between successive post-top luminaire.

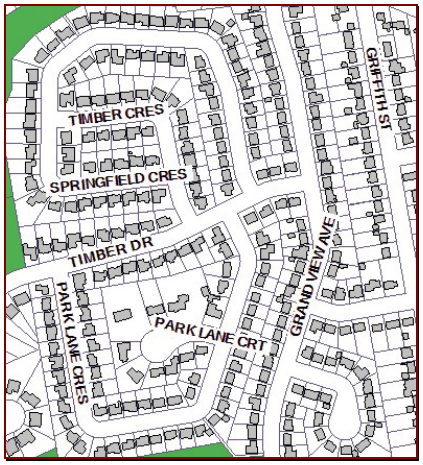


Figure 6-6, Typical Residential Subdivision Plan

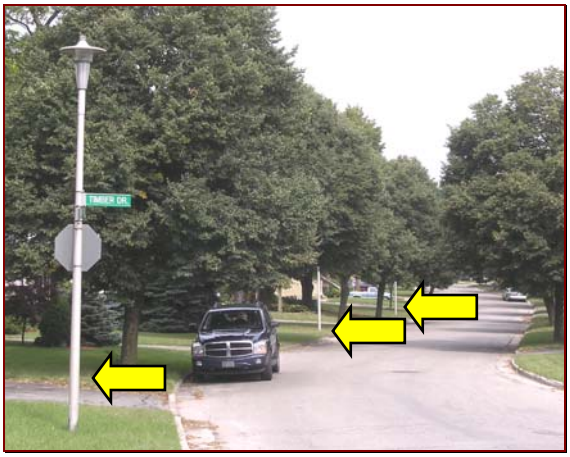


Figure 6-7, Typical Streetscape in Mature Residential Subdivision

London Hydro does not have the instrumentation or expertise to carry out RF coverage mapping nor interference tests to provide meaningful information to bidders.

6.1.4 Issues to Consider for Private Radio Frequency (RF) WAN Offerings

6.1.4.1 Licensed Spectrum

London Hydro holds licenses from Industry Canada for the radio spectrum identified below:

Table 6-1, London Hydro's Licensed Radio Spectrum

Industry Canada Reference No.	Xmt Freq (MHz)	Rcv Freq (MHz)	Application Notes
444-2237091	157.17000	153.68000	Mobile radios for Operations (Ch 2)
"	150.80000	150.80000	" (Ch 3)
"	155.43000	155.43000	" (Ch 4)
"		162.47500	" (Ch 5)
"	155.50500	159.34500	" (Ch 1)
444-4900821	414.76250	419.96250	Distribution automation switches
444-3524028	159.345000	155.50500	Main transmitter station (Ch 1)
"	952.21250	928.21250	SCADA link to Reservoir Xmtr
"	153.68000	157.17000	Main transmitter station (Ch 2)

London Hydro is also using unlicensed 900 MHz spread spectrum data radios in a limited-distance point-to-point data link application.

6.1.4.2 Existing Private Radio Communications Infrastructure

London Hydro has access to three (3) radio towers, one located within its head office premises at 111 Horton Street (as shown in Figure 6-8), a second located within the City of London's Springbank Reservoir lands on the north side of Commissioners Road between Wonderland and Baseline Roads (as shown in Figure 6-9), and the third located within the City of London's Arva Pumping Station lands on the north side of Medway Road just east of Wonderland Road (as shown in Figure 6-10). London Hydro presently has antennas and transmitter facilities at two of these sites for our licensed 400 MHz and 900 MHz frequencies that are used for vehicular communications and distribution automation systems respectively.

Figure 6-8, Head Office Radio Tower

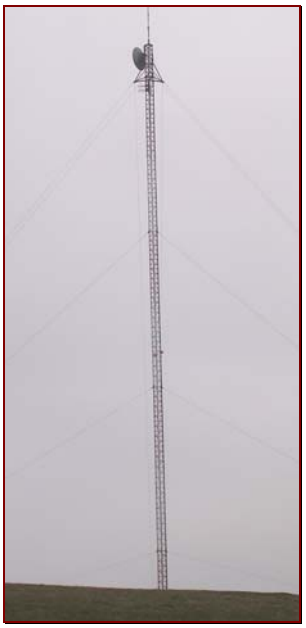


Figure 6-9, Arva Pumping Station Radio Tower

Figure 6-10, Springbank Reservoir Radio Tower

There are certainly several other privately-owned communications towers located within London Hydro's franchise service territory, but the mechanics and rental charges for joint occupancy are unknown.

6.1.5 Issues to Consider for Power Line Carrier (PLC) LAN Offerings

Bidders proposing power line carrier (PLC) or broadband over powerline (BPL) technologies are undoubtedly aware that the medium-voltage power distribution system can represent a very hostile environment for higher frequency transmission. Some of the known design challenges and characteristics of London Hydro's medium-voltage distribution circuitry are highlighted in the subsections below.

6.1.5.1 Distribution System Overview

The following table shows the extent of the medium-voltage and low-voltage circuitry within London Hydro's service territory:[3]

Table 6-2, Magnitude of London Hydro's Distribution System

	Low Voltage	2.4/4.16Y kV	4.8/8.32Y kV	8/13.8Y & 13.8Δ kV	16/27.6Y kV	Total
Number of Customers	136,318	8	-	30	131	136,487
Total Length of Circuits (km)		501	230	139	1,666	2,536
% Underground		30%	12%	75%	60%	50%

The 2.4/4.16Y, 4.8/8.32Y, 8/13.8Y and 16/27.6Y kV distribution systems are characterized as three-phase, four-wire, effectively-grounded systems. The 13.8Δ kV distribution system is a three-phase, three-wire distribution system.

The 2.4/4.16Y kV distribution system is generally being phased out (in favour of 8/13.8Y and 16/27.6Y kV distribution) as opportunities arise.

The 4.8/8.32Y kV distribution system is generally limited to the rural portion of London Hydro's service territory – those lands labeled "South Annexed" in Figure 6-1, *Franchise Service Territory For London Hydro* on page 30 herein. In time (i.e. over the next few decades), as urban development sprawls into these rural areas, the distribution circuitry will be upgraded to 16/27.6Y kV distribution.

6.1.5.2 Loop-Configured Radially-Operated Distribution Feeder Topology

With the exception of London Hydro's secondary network grid distribution systems in the core area of the city, and 13.8 kV primary grid system also in the core area of the city, all other distribution feeders circuits are typically arranged as loop-configured, radially-operated circuits.

[3] London Hydro document: *Quality of Supply Report – January 2005 to December 2005*; July 2006.; pg 5.

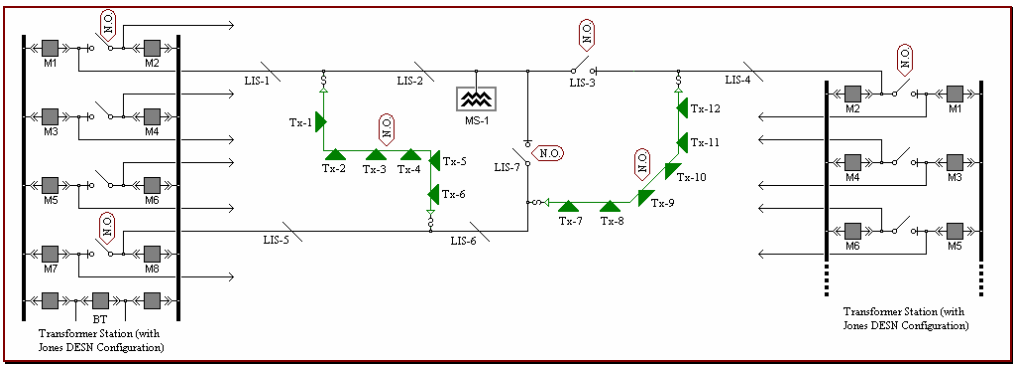


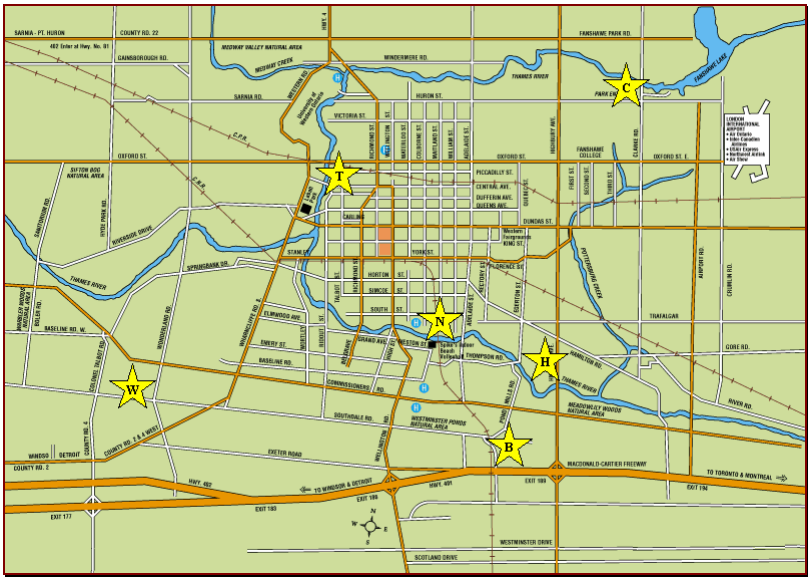
Figure 6-11, Typical Loop-Configured Radially-Operated Feeder Configuration

Figure 6-11 below shows a simple schematic diagram of such a primary distribution arrangement. There are feeder sectionalizing switches that are normally closed (LIS-1, LIS-2, LIS-4, LIS-5, and LIS-6) and there are switches that are normally open (LIS-3 and LIS-7) to allow segments of loads to be transferred to alternate feeders from the same source transformer station, or to alternate feeders from a different transformer station. For instance, the network can be reconfigured with the switch LIS-3 is closed; as this maneuver creates a loop in the network, the switch LIS-1 or LIS-2 must be opened to stay with a radial topology. As a result from this maneuver, municipal substation MS-1 will be transferred from the M1 feeder of transformer station "A" to the M2 feeder of transformer station "B".

It is imperative that communications to the Smart-meters not be lost as a result of daily configuration changes to London Hydro's primary distribution feeder circuits, nor should any system require London Hydro staff to manually update relationships between customers and supply feeder circuits as a result of feeder configuration changes.

6.1.5.3 Electrical Substations as Signal Injection Sites

London Hydro receives its supply of 8/13.8Y kV, 13.8Δ kV and 16/27.6Y kV via six (6) transformer stations that are owned, operated and maintained by Hydro One Networks (the provincial transmitter).



Legend:

B – Buchanan TS
C – Clarke TS
H – Highbury TS
N – Nelson TS
T – Talbot TS
W – Wonderland TS

Figure 6-12, Locations of Hydro One Networks' Transformer Stations

Note: For all intents and purposes, it may be assumed that the prospect of installing injection equipment in these transformer stations will be a long, drawn-out, expensive and frustrating process with little likelihood of success within the time horizon for the province's Smart-metering initiative.

London Hydro owns, operates and maintains fifty-three (53) vintage municipal substations that provide supply to the 2.4/4.16Y kV and 4.8/8.32Y kV distribution circuitry. But as can be seen from Table 6-2 (on page 35 herein), just as these distribution feeder circuits are diminishing over time, every opportunity is being taken to decommission the municipal substations.

6.1.5.4 Switched Capacitor Banks in Transformer Stations

With reference to Figure 6-12, *Locations of Hydro One Networks' Transformer Stations*, (refer to page 37 herein) switched capacitor banks are installed at the following locations:

- Nelson TS.....2 x 20 MVAr
- Highbury TS.....1 x 20 MVAr
- Wonderland TS .....2 x 20 MVAr

The capacitors are connected to the 13.8 or 27.6Y kV bus, and are remotely switched on or off by the provincial transmitter under the direction of the Independent Electricity System Operator.

Note: At this point, there are no shunt capacitors installed within London Hydro's municipal substations or on any distribution feeder circuits.

6.1.5.5 Radiated Emission Limits

London Hydro's aerial distribution circuits are typical of those framings found throughout the continent. As depicted in Figure 6-13, the aerial circuits are neither shielded nor well-balanced, so it is likely that some of the RF energy (from unlicensed PLC or BPL) they carry will be radiated. It is imperative that licensed users on the same frequency bands as Access BPL signals not receive harmful *near-field* interference from this signal leakage.

Figure 6-13, Typical Three-Circuit Aerial Construction

Note: There are three components to the RF energy on the power distribution circuits: the conducted component, the near field component, and the radiated component. The conducted component will be received by the PLC or BPL receiver. The near-field and radiated components will be received by any nearby receiver through its antenna. Near-field susceptibility will occur close to the power line (less than 10 wavelengths); radiated susceptibility will occur at distances greater than 10 wavelengths. Of the two, near-field susceptibility presents the greatest strength interference, and most problematic interference coupling mode.

Note: Additionally, the variation in line impedance, presence of impedance discontinuities, and loss characteristics of the distribution circuits likely result in a rapid decrease in conducted PLC/BPL signal strength along the line.

Until such time as Industry Canada has formulated specific regulations covering Access BPL systems, all PLC or BPL components shall meet the US Federal Communications Commission's (FCC) recently established technical and operational rules for BPL systems as set forth in its Code of Federal Regulations (CFR) Title 47, *Telecommunication*, Chapter 1, *Federal Communications Commission*, Part 15 – *Radio Frequency Devices*.[4]

Note: Because of the similarities between the U.S. and Canadian electrical distribution systems, and the perceived importance of technical harmonization between the two countries, it is predicted that Industry Canada regulations will closely mirror those of the FCC.

It is further expected that, for a period of eighteen months after formal AMI system acceptance, the successful bidder will investigate and mitigate all reported instances of harmful interference.

6.1.6 Other Service Conditions

Environment Canada maintains 15-years of online climate data (e.g. average and extreme temperatures, rainfall, snowfall, etc) on their website.[5] The appropriate

[4] Regulations available electronically from the U.S. Government Printing Office's (GPO) website at URL: http://www.access.gpo.gov/nara/cfr/waisidx_05/47cfr15_05.html

[5] Canadian climate data available online from Environment Canada's website at URL: http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html

information may be extracted by requesting data for the weather station designated "London A".

6.1.7 Existing Meter Populations and Installation Densities

6.1.7.1 Revenue Meters within Scope of Provincial AMI Specification

The northerly part of London Hydro's franchise service territory is largely urban, whereas the southern part remains mostly rural. Maps that visually depict the installation densities for revenue meters are included as Appendix C.

The varieties and numbers of watt-hour revenue meters installed in London Hydro's franchise service territory (as of August 21, 2006) are tabulated below.

Table 6-3, Population of Energy-Only Revenue Meters

Style of Revenue Meter	Indoor		Outdoor	
	S-base	P/A-base	S-base	P/A-base
Single-Phase; 3W, 240 V, SC	14,426	347	105,356	21
Single-Phase; 2W, 120 V, SC	--	123	2	--
Single-Phase; 2W, 240 V, Tx	157	25	159	--
Network; 3W, 120/208Y V, SC	9,604	76	283	--
Polyphase; 4W, 120/208Y V, SC	2,858	95	204	--
Polyphase; 4W, 347/600Y V, SC	1,674	23	82	--
Polyphase; 3W, 600V Δ, SC	69	37	11	--
Polyphase; 3W, 240V Δ, SC	--	4	--	--
Polyphase; 3W, 120V Δ, Tx	--	43	--	--

Abbreviations in Table:

SC = self-contained revenue meter
Tx = transformer-type revenue meter
S-base = socket-type or plug-in meter case, as defined in Section 3.3, *Cases*, of CSA Standard CAN3-C17-M84 (R2004), *Alternating-Current Electricity Metering*.
P/A-base = bottom-connected meter case, as defined in Section 3.3, *Cases*, of CSA Standard CAN3-C17-M84 (R2004), *Alternating-Current Electricity Metering*.

Note: The above tabulation is simply to give bidders some indication of the varieties and population distribution of the different meter types for the purpose of sizing databases and establishing communications systems throughput requirements. The actual quantities and types being procured are stipulated in Section 5.1 on page 12 herein.

Note: Several hundred revenue meters have been omitted from the tabulation as their base-type and installation location (indoor or outdoor) is not known and is indicated as "*Unknown*" in our Customer Information System (CIS). Such records will be corrected in future as the meter seals expire.

There are also a number of electric services within London Hydro's service territory that are outfitted with combination energy and demand meters, but for which the

electric demand isn't read and billed as the customer's consumption pattern has fallen below (or never attained) the tariff threshold (i.e. 250,000 kWh/yr) for "*general service less than 50 kW*". These meters are tabulated in Table 6-4 below, and would fall within the provincial AMI specification.

Table 6-4, Population of Combination Meters on Energy-Only Services

Style of Revenue Meter	Indoor		Outdoor	
	S-base	P/A-base	S-base	P/A-base
Single-Phase; energy & demand	50	180	58	3
Polyphase; energy & demand	529	807	28	71

6.1.7.2 Revenue Meters beyond Scope of Provincial AMI Specification

London Hydro also has a considerable population of single-phase and polyphase combination energy & demand revenue meters installed (for customers with electric loads greater than 50 kW). Although these services fall outside the provincial AMI specification, London Hydro is keenly interested in using the AMI communications infrastructure to remotely interrogate these revenue meters.

Table 6-5, Population of Transformer-Rated Combination Energy & Demand Meters

Style of Revenue Meter	1-Element	2-Element	2½-Element	3-Element
> 50 kW and ≤ 200 kW				
• 1-Phase; energy & demand	20			
• 3-Phase; energy & demand		17	609	235
Greater than 200 kW:				
• 3-Phase; energy & demand			659	

The revenue meters included in Table 6-5 above have an "A" or "P" case style, are installed in a steel metering enclosure, and if replaced to connect to the AMI system, the replacement meters will be configured as two-channel devices (measuring both active energy in W·h, and apparent energy in VA·h) with a 15-minute interval.

Note: To comply with Measurement Canada bulletin E-24 (Rev. #1, 2002-11-29), *Policy on Approval and Use of 2½ Element Metering*, wherever possible, the revenue meter will be upgraded to a 3-element installation under this initiative.

Note: For the greater than 200 kW class, interval-style revenue meters are already installed with dial-up telecommunications circuits to London Hydro's MV-90 data collection system. In time, if the AMI communications technology permitted, the telephone circuits would be abandoned in favour of connections to the AMI communications infrastructure.

The revenue meters (and communications requirements thereof) shall be considered in sizing the AMI master control computer database, and in estimating the performance requirements of the communications systems.

6.2 Technical Requirements for AMI

6.2.1 General Organization of Requirements

For the purposes of this RFP, London Hydro has adopted a four-level approach to defining the technical requirements for the Smart-meter system. The levels are depicted in Figure 6-14 and individually described below.

- Level 4 – London Hydro's requirements for both mandatory and discretionary value-added functionality
- Level 3 – London Hydro's supplementary requirements for devices and inter-device communications infrastructure, e.g. protocol, security, etc.
- Level 2 – Ontario Ministry of Energy's technical requirements for advanced metering infrastructure (AMI)
- Level 1 – Basic purchasing descriptions for single-phase (residential) energy meters, network (apartment) energy meters, and polyphase (small commercial) energy meters.

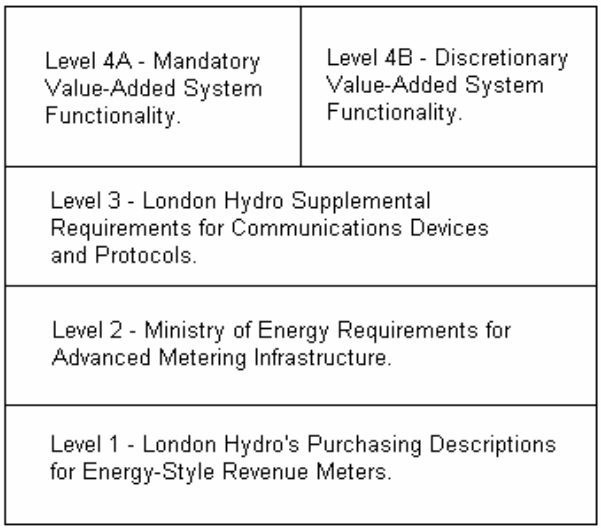


Figure 6-14, Functional Building Blocks

The level requirements are outlined in the subsections that follow.

6.2.2 Purchasing Descriptions for Energy Meters (Level 1)

London Hydro's purchasing descriptions for the various types of energy meters that fall within the realm of the provincial Smart-meter initiative are included as Appendix A herein.

Note: It is essential that the proposed revenue meters have case styles and terminal arrangements in accordance with Figures 1 through 9 of CSA Standard CAN3-C17-M84 (R2004), *Alternating-Current Electricity Metering*. Non-conforming arrangements will be considered impractical and not considered.

Bidder's submissions shall include the Measurement Canada *Notice of Approval* reference that applies to the proposed energy meter complete with the proposed *advanced meter communication device (AMCD)* accessory – refer to Section 3.2 of Ministry of Energy publication *AMI Functional Specifications* for a definition of "AMCD".

Note: Initial meter seal life (as stipulated in the Notice of Approval) will be given consideration in the overall assessment of system ownership costs.

London Hydro is interested in interoperability and choice. Bidder's submissions shall also include a list of other approved electric meter makes and models that interoperate

with the proposed AMI. Proposals that demonstrate interoperability will be given favourable consideration.

Note: Although the Ministry of Energy's AMI Functional Specification is limited in scope to electric energy meters (i.e. non-demand meters), if polyphase electric meters with a demand register for commercial, industrial and institutional customers can be supported by the proposed AMI, it is recommended that bidder's submissions additionally include a list of such approved electric meters.

Revenue meters equipped with "tilt" or "inverted meter" tamper alarming features shall show evidence that false triggering due to ordinary vibration (due to large truck operation in the vicinity of the meter) is unlikely to occur.

Revenue meters shall be equipped with a green LED (or similar signaling device) to indicate establishment of a communications link between the meter's AMCD and an upstream regional collector.

6.2.3 MoE Technical Requirements for Advanced Metering Infrastructure (Level 2)

The Ontario Ministry of Energy has published their requirements for Advanced Metering Infrastructure within Ontario Regulation 425/06, *Criteria and Requirements for Meters and Metering Equipment, Systems and Technology,* which in turn references a document entitled: *Functional Specification for an Advanced Metering Infrastructure (AMI)*; dated July 14, 2006.[6] A copy has been included within Appendix B herein for convenience of reference.

To avoid confusion or misunderstandings, the following clauses within the Ministry specification shall be interpreted as following:

- Clause 2.5.1.3 – the proper standards reference is IEEE Standard C37.90.1-2002, *Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus.* Product immunity levels (on both power input and I/O interfaces) to surges and fast transients shall be no less than:
  - AMCD: 1 kV for oscillatory surges, and 1 kV for fast transients;
  - AMRC: 2 kV for oscillatory surges, and 2 kV for fast transients.
- Clause 2.7.1.1 – It is essential that any technology proposed that makes use of RF spectrum be fully compliant with the applicable Industry Canada criteria for frequency, bandwidth, power, modulation and radiation pattern.[7] Specifically, the RF energy radiated from a RF system shall comply with the applicable spectral mask and EIRP (Equivalent Isotropically Radiated Power or, alternatively, Effective Isotropic Radiated Power) as is dictated by Industry Canada, regardless

[6] This document is posted electronically on the Ministry of Energy's website at URL: http://www.energy.gov.on.ca/english/pdf/electricity/smartmeters/Functional_Specification_for_Advanced_Metering_Infrastructure.pdf

[7] Official publications of Industry Canada's Spectrum Management and Telecommunications division are available electronically at URL: http://strategis.ic.gc.ca/epic/internet/insmt-gst.nsf/en/h_sf01841e.html

if the spectrum proposed is classified as licensed or unlicensed. RF systems will be deemed to include radios, cables, connectors, filters, antennas, and all associated RF paraphernalia and accessories. The bidder is responsible to ensure that all the possible system variations proposed for the RF package will be also compliant or expressly state exceptions or exclusions.

- Clause 2.13.1 – In addition, it is essential that all systems and installations meet or exceed all relevant regulations pertaining to the safe implementation of RF radiating devices and systems as directed by Health Canada within their publication entitled: *Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz - Safety Code 6*; 1999.[8] To the extent that it may apply, products proposed shall also be designed to meet or exceed the installation standards for mounting RF systems on poles, towers and structures as set forth in CSA Standard S37-01, *Antennas, Towers, and Antenna-Supporting Structures*. Furthermore, grounding of these RF systems shall be as set forth in CSA Standard C22.1-02, *Canadian Electrical Code, Part I (19th Edition) - Safety Standard for Electrical Installations.*

6.2.4 Supplementary AMCD Requirements (Level 3)

6.2.4.1 Antenna & Transceiver Design Objectives for Wireless LAN Offerings

Desirable features of the antennae and transceiver components integrated into an under-the-glass AMCD intended for connection to a wireless LAN include: extended range (including ability to penetrate certain obstructions like foliage, windows, and walls), high modulation, interference mitigation, and 360° coverage.

Bidders shall include a comprehensive description of their antennae and transceiver technology, paying particular attention to any design limitations to their implementation of the above-listed features, or expanding on design features that exceed the desired features and provide true value to the LDC. Specific RF performance information to be submitted includes (but is not necessarily limited to) the following:

- the spectral mask and EIRP (Equivalent Isotropically Radiated Power or, alternatively, Effective Isotropic Radiated Power) measurements;
- antenna pattern plots for both the E-and the H-plane;
- the antenna gain, polarity and type (e.g. dipole), as well as the power amplifier output levels;
- the modulation standards used; and
- a breakdown of the data traffic identifying gross rate, net rate, alpha, forward error correction, and whether the radio systems are half or full duplex.

[8] This document is posted electronically on Health Canada's website at URL: http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/radiation/99ehd-dhm237/99ehd-dhm237_e.pdf

Note: Most, if not all, of this requested information would be included in a manufacturer's submission to Industry Canada for *Technical Acceptance Certificate (TAC)* for "*Category I"* RF devices, pursuant to Radio Standards Procedure 100, *Radio Equipment Certification Procedure*.

Bidders shall additionally indicate whether or not there is an interface that can be connected to by an external system for test or external radio applications, and the type of interface (Ethernet, 70 MHz IF, etc.) and connector (RJ-45, BNC, etc.) used to access this interface. If it is not applicable to your product offering, then please advise this point.

6.2.4.2 Transceiver Design Objectives for Power Line Carrier (PLC) LAN Offerings

Desirable features of the transceiver components integrated into an under-the-glass AMCD intended for connection to a power line carrier (PLC) or broadband over powerline (BPL) LAN include an Ethernet connection with an RJ-45 jack. The Ethernet connection shall adhere to all applicable IETF and IEEE standards for data transmission formatted as Ethernet.

Industry Canada has not yet established a firm and final specification for power line carrier (PLC) or broadband over powerline (BPL). However, it is generally assumed that the following principles will be enforced.

- Any use of spectrum higher than 30 MHz is consider undesirable
- Emission exceeding 30 MHz and not exceeding 80 MHz may be tolerated if adaptable notch filtering techniques are employed in the design to suppress emissions that may cause interference to existing incumbents, such as military, shortwave, amateur and broadcast communications
- Canada is expected to harmonize its PLC and BPL standards, policies and applications with those of the United States and other members of the World Radio Commission (WRC)
- Utilization of spectrum under 30 MHz and from 30 MHz to 80 MHz is anticipated to become subject to limitations regarding EIRP as given in the following table:

Table 6-6, EIRP Limits for PLC / BPL Transceivers

Technology	Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)
PLC and BPL	< 30 MHz	30	30
BPL only	30 MHz to 80 MHz	90	10

The proposed emission limits for BPL systems will create harmful interference to typical MF/HF/VHF signals that are being received by radio operators adjacent to BPL-carrying power lines. Ideally, the emission limits should be 40 dB less, or 0.3 μV/meter at 30 meters.

Most Amateur Radio stations are located within 30 m of a LV or MV power line. A dipole antenna located near a BPL power line (often less than 30 m) will intercept an interfering BPL signal that is substantially greater than the typical weak-signal from a distant station. An emission level of 30 μV/m would block all reception except for the very strong signals, which are not typical.

6.2.4.3 Low Temperature AMCD Operation

With respect to Clause 2.4.5, *Environmental Tolerances*, of the Ministry of Energy's functional specification (included within Appendix B herein for convenience of reference), bidders shall indicate the lowest ambient temperature for which the oscillator module within transceivers will successfully operate without frequency change, increased jitter, or other impairment (e.g. ceased operation).

6.2.4.4 Product RF Certification

Bidders shall include a photocopy of their *Technical Acceptance Certificate (TAC)* for "Category I" equipment pursuant to Industry Canada's Radio Standards Procedure 100, *Radio Equipment Certification Procedure*.[9]

Note: Industry Canada maintains an online listing radio equipment that has been certified for use in Canada. This online Radio Equipment List (REL) may be accessed at URL: http://strategis.ic.gc.ca/epic/site/ceb-bhst.nsf/en/h_tt00020e.html

6.2.5 Supplementary LAN Requirements (Level 3)

6.2.5.1 LAN Offerings Based on Wireless Mesh RF Technology

Where wireless LAN technology is offered, it shall be a self-forming, self-healing, network mesh topology characterized as requiring minimal management, readily overcoming obstacles and interference to provide reliable service, and easy expansion into new territory. Desired features of the wireless mesh include the following:

- Automatic Node Discovery - Whenever a new revenue meter (node) is added to the network, it is automatically detected and establishes links with other revenue meters and regional collectors that surround it.
- Optimized Best-Path Routing - To ensure optimal performance throughout the network, a best-path routing algorithm shall consider every link's available capacity and number of hops to the master control computer.
- Dynamic Rerouting – Any changes in LAN link state (e.g. additions, removal, or loss of a link) shall cause dynamic recalculation of best-path routes to ensure the network is tuned for peak performance.

[9] Refer to Industry Canada publication entitled: *Standards and Certification of Radio Apparatus and Electronic Equipment Used in Canada*; 1998. Document available electronically at URL: http://strategis.ic.gc.ca/epic/internet/insmt-gst.nsf/vwapj/tac-e-bw.pdf/$FILE/tac-e-bw.pdf

- Scalable Capacity & Load Balancing - Adding capacity to the network should be as simple as adding regional collectors - additional regional collectors provide additional paths to the master control computer, and the dynamic rerouting algorithm shall use these new routes to dynamically balance the traffic load across all of the regional collectors through traffic segmentation.
- Failover Routing - If any regional collector or other mesh node fails or loses connectivity, the algorithm automatically finds an alternate path and dynamically recalculates routes to find the best path to traverse the network.
- Manual Override – There shall be control provisions for technical staff to override automation features at individual nodes to force specific communications paths for test purposes or to accommodate an unusual system conditions (e.g. preferred link interrupted regularly by passage of train, etc.).

Bidders shall include a comprehensive description of their wireless mesh RF technology, paying particular attention to any design limitations to their implementation of the above-listed features, or expanding on design features that exceed the desired features and provide true value to the LDC.

Note: Although the term wireless mesh is used herein, it is not intended to preclude bidders from offering star-mesh hybrid network topology solutions, provided the objectives stated above are fulfilled.

Note: The mesh description shall define the base RF data rate, the latency per hop and the maximum number of hops supported by the system, as well indicate the degradation in throughput (if any) as the number of hops increases. For these measures, the bidder shall indicate what data is being returned by the system (i.e. meter read, voltage information, alarms, event flags, etc.). The bidder shall further include a measure of the total communications latency for 1 hop, 3 hop and 5 hop scenarios for an on-demand kWh register and interval read.

Bidders shall also include a description of the metrics provided for measuring the real-time (or near real-time) performance of the data paths (e.g. bit error rate, expressed as number of bit errors divided by number of bits received) or RF paths (e.g. signal strength in dBm, and signal-to-noise ratio in dB). It is suggested that illustrative screen prints or excerpts from the user manual, or both, be submitted to assist London Hydro in understanding the presentation of such information to system users and gauging the effectiveness of the bidder's offering as a diagnostic tool.

While it is recognized that there isn't yet a standard for mesh radios, preference will be given to radios that conform most closely to IEEE draft standards. A field-upgradeable radio that will permit updates to the mesh operating systems may be preferred if the cost for this feature is not prohibitive. Meter firmware (with the exception of the internal metrology section) should be upgradeable remotely. If the radio needs to be upgraded manually (chip set change) or locally by attaching a computer and then uploading new firmware, then please indicate this limitation.

Mesh radios will need data management features similar, if not identical, to any modern wired network; and as are listed above. In addition, it is important to communicate the basis of how the mesh radios will discover, update, reroute, add / drop / pass, and generally connect to the regional controller. Describe the fail-over

procedures if a regional collector fails and other regional collectors are within range of the mesh cluster and can handle the added loading when reached. What metrics define the Maximum Transmission Unit (MTU) costing and is your MTU compliant with the IETF RFC 1191 and the applicable IEEE standards for Ethernet routing?

6.2.5.2 LAN Offerings Based on PLC or BPL Technology

Where PLC or BPL LAN technology is offered, it shall be a self-forming, self-healing, network topology characterized as requiring minimal management, readily overcoming obstacles and interference to provide reliable service, and easy expansion. Desired features of the PLC or BPL LAN include the following:

- Automatic Node Discovery - Whenever a new revenue meter (node) is added to the network, it is automatically detected and establishes links with the regional collectors.
- Optimized Best-Path Routing - To ensure optimal performance throughout the network, a best-path routing algorithm shall consider every link's available capacity and number of hops to the master control computer.
- Dynamic Rerouting – Any changes in LAN link state (e.g. additions, removal, or loss of a link) shall cause dynamic recalculation of best-path routes to ensure the network is tuned for peak performance.
- Scalable Capacity & Load Balancing - Adding capacity to the network should be as simple as adding regional collectors - additional regional collectors provide additional paths to the master control computer, and the dynamic rerouting algorithm shall use these new routes to dynamically balance the traffic load across all of the regional collectors through traffic segmentation.
- Failover Routing - If any regional collector fails or loses connectivity, the algorithm automatically finds an alternate path and dynamically recalculates routes to find the best path to traverse the network.
- Manual Override – There shall be control provisions for technical staff to override automation features at individual nodes to force specific communications paths for test purposes or to accommodate an unusual system condition (e.g. preferred link interrupted regularly grid switching, etc.).

Bidders shall include a comprehensive description of their PLC or BPL LAN RF technology, paying particular attention to any design limitations to their implementation of the above-listed features, or expanding on design features that exceed the desired features and provide true value to the LDC.

Bidders shall also include a description of the metrics provided for measuring the real-time (or near real-time) performance of the data paths (e.g. bit error rate, expressed as number of bit errors divided by number of bits received) or RF paths (e.g. signal strength in dBm, and signal-to-noise ratio in dB). It is suggested that illustrative screen prints or excerpts from the user manual, or both, be submitted to

assist London Hydro in understanding the presentation of such information to system users and gauging the effectiveness of the bidder's offering as a diagnostic tool.

While it is recognized that there isn't yet a standard for PLC or BPL LAN, preference will be given to radios that conform most closely to IEEE drafts or standards for standard Ethernet networks. A field upgradeable radio that will permit updates to the PLC or BPL LAN operating systems may be preferred if the cost for this feature is not prohibitive. Meters (with the exception of the internal metrology section) should be upgradeable remotely. If the radio needs to be upgraded manually (chip set change) or locally by attaching a computer and then uploading new firmware, then please indicate this limitation.

PLC or BPL LAN radios will need data management features similar, if not identical, to any modern wired network; and as are listed above. In addition, it is important to communicate the basis of how the PLC or BPL LAN radios will discover, update, reroute, add / drop / pass, and generally connect to the regional controller. Describe the fail-over procedures if a regional collector fails and other regional collectors are within range of the PLC or BPL LAN cluster and can handle the added loading when reached. What metrics define the Maximum Transmission Unit (MTU) costing and is your MTU compliant with the IETF RFC 1191 and the applicable IEEE standards for Ethernet routing?

6.2.6 Supplementary Inter-Device Communications Requirements (Level 3)

6.2.6.1 General

London Hydro does not wish to be locked into a single-vendor proprietary-technology AMI solution – while proprietary equipment may be lower priced initially, it will certainly be more costly to utilities and ratepayers over its life cycle. London Hydro is therefore most interested in AMI systems designed for *open systems interoperability*, i.e. systems based on so-called "open" communications methods and protocols between the revenue meters and the regional collector, between the regional collectors and the central computer, and between the central computer and external computer systems (e.g. SME and London Hydro's application-specific computers).

The AMI system also constitutes a substantial public infrastructure and as such London Hydro is further interested in the state-of-the-art in data security as protection against cyber attack and unauthorized intrusions.

Specific requirements aimed at fulfilling these broad goals are given in the sections that follow.

6.2.6.2 Communications Network Interface

The preferred application layer interface for data transfer (i.e. ANSI table reads and writes) from the revenue meter, over the communications network, to upstream terminal devices shall conform to the latest draft edition of ANSI Standard C12.22-200x, *Protocol Specification for Interfacing to Data Communications Networks*.

Note: This document is also published as IEEE Standard P1703, *Local Area Network / Wide Area Network (LAN/WAN) Node Communication Protocol to Complement the Utility Industry End Device Data Tables.*

Given the uncertainty as to when ANSI draft Standard C12.22 will be promulgated, approaches which use utilize native internet protocols and technologies (e.g. IPv6 addressing, integrity, security, quality of service, etc.; UDP packet transmission; DNS name resolution; etc.) to provide the required network and application layer services (including quality of service and security) will be given equal consideration. For this alternative, the Supplier shall provide a comprehensive definition of the services provided, the public domain standards adopted for each service, and all instances of "*almost implementations*" where standard tables, procedures or protocol services have been partially implemented with non-standard tweaks.

6.2.6.3 Data Formats and Structures

The flexible data structures ("tables") used within the revenue meter, the syntax for identifying and describing these structures, and the data structures for transporting utility data to and from other end devices, shall conform to NEMA/ANSI Standard C12.19-1997, *Utility Industry End Device Data Tables.*

Note: This document is also published as IEEE Standard P1377, *Utility Industry Metering Communication Protocol Application Layer Standard (End Device Data Tables).*

The supplier shall explicitly identify all instances of "*almost implementations*" where standard tables, procedures or protocol services have been partially implemented with non-standard tweaks.

Note: London Hydro's preference is that tables or procedures used in a revenue meter should either follow the standard or be re-defined as manufacturer specific structures. Non-standard protocol services are undesirable.

The supplier shall provide an End Device Language (EDL) text file fully describing every table and procedure (both standard and manufacturer-defined) accessible by the users.

6.2.6.4 Electronic Security

It is essential that the AMI system have, as a minimum, end-to-end protections against cyber attack and unauthorized intrusions. Specifically, the AMI system design shall comply with the minimum requirements set forth in the particular publications (within the NERC *Critical Infrastructure Protection* suite of security standards[10]) identified below:

- NERC Standard CIP-005-1, *Cyber Security – Electronic Security,* as it applies to a "*load serving entity*"; and

[10] NERC security standards are posted electronically on the North American Electric Reliability Council (NERC) website at URL: http://www.nerc.com/~filez/standards/Reliability_Standards.html#Critical_Infrastructure_Protection

- NERC Standard CIP-007-1, *Cyber Security – Systems Security Management*, as it applies to a "*load serving entity*".

Note: It is expected that those elements of NERC Standard CIP-004-1, *Cyber Security – Personnel & Training*, specific to "*training*" would be prepared by the successful vendor and included within the requisite staff training – see Section 6.5 on page 75 herein.

The submission shall include an illustration (e.g. block diagram) and supporting text descriptions of the "electronic security perimeter" scheme that is inherent in the bidder's AMI system design and proposed to be included for access to external systems (e.g. provincial MDM/R, CIS, etc.).

Note: The following electronic security techniques are generally understood by London Hydro, and the security scheme description shall indicate where they are used (if at all):

- Data encryption
- MAC address filtering
- DHCP (dynamic host configuration protocol)
- NAT (network address translation)
- Built-in firewall
- User authentication (CHAP)
- Password access (PAP)
- Centralized password repository (global, regional, cluster or unit remote updates)
- Bandwidth restrictions (limited data rate per unit)
- Traffic analysis restrictions (watch for irregular traffic flows)
- Automatic "call home" modems
- ACL (access control lists)
- Traffic logging
- Compliance with The Common Criteria (CC) which is an international standard (ISO/IEC 15408) or as a minimum CTCPEC (Canadian Trusted Computer Product Evaluation Criteria)

The supplier shall include in its submission a complete disclosure of those aspects of the AMI system that, at present, do not or can not fulfill the recommendations set forth in the NERC *Critical Infrastructure Protection* security standards referenced above.

A white paper defining the bidder's development plans for security enhancements would be welcome.

Note: Bidders should not underestimate or take lightly the importance that London Hydro places on electronic security in the bid evaluation process. It doesn't subscribe to the notion that proprietary protocols and approaches provide sufficient security against cyber attack and other unauthorized intrusions. Rather it is seeking standardized approaches that exceed the minimum requirements without unduly encumbering the usability of the system from the end users perspective.

6.2.7 Supplementary Regional Collector Requirements (Level 3)

6.2.7.1 General

Regional collectors shall be rugged and designed for long-life operation in extreme environments. It is essential that the regional collector not be unsightly, i.e. the colour and shape of the device shall blend with the installation environment as opposed to drawing attention to the unit.

Note: It is strongly suggested that, in their proposals, bidders make clear that they are cognizant of the key design philosophy differences between consumer-grade electronics and industrial- or military-grade products, and provide evidence via photographs or brochures of the design measures incorporated into their regional collector to provide reliable long term operation (i.e. long mean-time-between-failures).

6.2.7.2 Transceiver Design Objectives

With respect to the regional collector, bidders shall include a comprehensive description of their antennae / coupling device and transceiver technology. The information to be submitted shall be the same as in:

- Section 6.2.4.1, *Antenna & Transceiver Design Objectives for Wireless LAN Offerings*, on page 43 herein (as it applies to the antennae and transceiver for the regional collector);
- Section 6.2.4.2, *Transceiver Design Objectives for Power Line Carrier (PLC) LAN Offerings*, on page 44 herein (as it applies to the coupling device and transceiver for the regional collector).

6.2.7.3 Loss of Supply Response

With respect to Clause 2.7.2, *Maintenance of Power*, within the Ontario Ministry of Energy's AMI Specification (included as Appendix B for convenience of reference), the service continuity for London Hydro's electrical distribution system can be characterized as follows:[11]

- System Average Interruption Duration Index (SAIDI):..... 1.15 hours per customer per year
- Customer Average Interruption Frequency Index (SAIFI):..... 1.65 interruptions per customer per year
- Customer Average Interruption Duration Index (CAIDI): ..... 42 minutes per incident

[11] London Hydro internal publication *Quality of Supply Report - January 2005 to December 2005*; issued July 26, 2006.

The regional collector's backup power supply (if required) shall be sized to provide a design capacity factor of two (2X) or more, i.e. there shall be sufficient capacity to withstand a service interruption twice the value given above.

Bidders shall include optional adder pricing for extended backup capacity designs (e.g. 4 hour, 8 hour, etc.) that are technically feasible.

6.2.7.4 Low Temperature Regional Collector Operation

With respect to Clause 2.4.5, *Environmental Tolerances*, of the Ministry of Energy's functional specification (included within Appendix B herein for convenience of reference), bidders shall indicate the lowest ambient temperature for which the oscillator module within transceivers will successfully operate without frequency change, increased jitter, or other impairment (e.g. ceased operation).

6.2.7.5 Product Certification

Bidders shall include a photocopy of their *certificate of compliance* to CAN/CSA Standard C22.2 No. 60950-1-03, *Information Technology Equipment – Safety – Part 1: General Requirements*, (or the CSA standard that is more applicable to their regional collector) with the proposal.

Bidders shall also include a photocopy of their *Technical Acceptance Certificate (TAC)* for "Category I" equipment pursuant to Industry Canada's Radio Standards Procedure 100, *Radio Equipment Certification Procedure*.

6.2.7.6 WAN Migration Features

For offerings based on a public carrier WAN, to provide a migration path to the municipal broadband wireless network (refer to Section 2.5 on page 5 herein), there will need to be some form of connectivity at the regional collector to integrate to a Wi-MAX relay radio package (provided and installed by London Hydro outside of this contract). This interface (in order of preference, from most preferred to least preferred) shall be one of:

- an RF connection using some form of Intermediate Frequency (IF) over a BNC connector; or
- a baseband Ethernet connection using an RJ-45 connector.

Bidders shall describe the interface and the traffic format that is being offered, as well as the gross data payload that can flow over this connection.

6.2.8 Supplementary Master Control Computer Requirements (Level 3)

The AMI Master Control Computer shall perform four (4) categories of functions, namely:

- Meter data collection – collects and stores revenue metering readings and power quality data from field devices into a database management system, and exports subsets of this data to other computer systems.
- End-device control – provides accurate time reference to revenue meters, dispatches commands to meters for disconnect & reconnect, loads new operational data into end devices, etc.
- Exception reporting – reports events such as meter tampering, loss of supply voltage, communications link outage, etc.
- Infrastructure & network management – The AMI master control computer shall provide user interfaces so that technical and support staff "see" the actual interconnections to make informed decisions regarding communications network configuration and security. It shall provide the means to monitor the (mesh) network's status from end-to-end in real-time, and provide ample performance and activity statistics. It shall also afford some form of command and control over the network.

These basic classes of functions are detailed in other parts of this specification.

6.2.8.1 Preferred Hardware and Operating System Platform

London Hydro has migrated to the following hardware and operating system products for corporate computing:

- Hewlett-Packard's BladeSystem equipped with model BL25-p server blades (dual 64-bit AMD processors with 16GB of RAM);
- ESX Server, Version 2 (using both Windows 2000 and 2003 images) virtual machine software; and
- Red Hat Enterprise Linux, Version 4 (including updates 1 – 3).

Preference will be given to AMI Master Control Computer designs that can operate on this platform.

To provide for fair comparison, bidders with products designed to operate on London Hydro's corporate computer system shall include a "*cash allowance*" in their submission to cover the procurement cost of the required number of additional server blades for the AMI application.

Note: As part of contract negotiation process with the successful bidder, London Hydro may elect to procure the server blades via its normal supply channels and reduce the contract price by the stipulated "cash allowance" amount.

6.2.8.2 Fault Tolerant Redundant Configuration

The AMI Master Control Computer shall have a redundant configuration (i.e. main and standby). The standby server computer shall be maintained in a fully synchronized state; and on fail-over, all peripheral and communication equipment

shall be automatically transferred to the backup server computer without any operator intervention.

The backup / synchronization software features shall include:

- Secure synchronization of backup server, with error detection and database verification;
- Continuous maintenance of backup server synchronization in real time; and
- Fail-over initiation by online or backup server on hardware or diagnostic routines failure.

London Hydro is receptive to multi-processor architectures provided the underlying objective (i.e. fault tolerance and data preservation) is fulfilled.

Main and standby server computers shall have independent connections the Wide Area Network (WAN).

Other AMI Master Control Computer features to preserve the integrity of the applications and data, and to minimize system recovery time shall include as a minimum:

- Software crash tolerance: Server and client software shall maintain its integrity in case of power failures and abrupt shutdowns.
- Restart/Recovery: The system shall be capable of restart and recovery after system failure with no loss of data or software components.
- Integrity checking feature: Must provide the capability of identifying the existence of program and/or system discrepancies.
- File protection: This feature shall provide the capability to limit the types of operations (e.g. read, write, delete, data dictionary modification) that can be performed by individual users on given data or program files.

6.2.8.3 User Interface Design Requirements

The organization of information on visual displays, use of colours, and user interaction shall conform to good human engineering design practices. MITRE Corporation publication ESD-TR-86-278, *Guidelines for Designing User Interface Software*, August 1986[12] shall be considered the reference publication for the design and evaluation of user interfaces to visual display terminals.

6.2.8.4 Integration with Centralized Meter Data Management / Repository

As depicted in Figure 6-15 below, the Ontario Government's smart meter initiative includes plans for a centralized Meter Data Management / Repository (MDM/R)

[12] MITRE Corporation publication ESD-TR-86-278 available online at URL: http://hcibib.org/sam/

agency. The role of the MDM/R is to provide a common infrastructure for receiving meter readings from all AMI in Ontario, processing the reads to produce rate-ready data (that is, data to support billing), storing and managing data, and providing access to such data to Interested Parties. The AMI systems are expected to transmit their time-stamped meter reading data on a daily basis to the MDM/R using a common protocol and file structure.

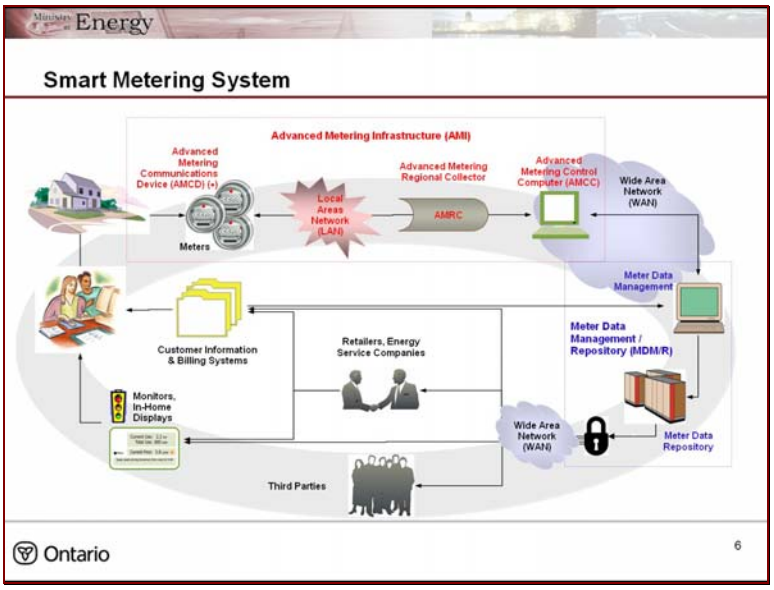


Figure 6-15, Ministry Vision of Smartmeter Process Model

It is essential that the AMI Master Control Computer include an interface for transfer of all relevant data to and from the MDM/R in accordance with the established format and protocol - refer to Ministry of Energy publication: "*Functional Specifications For a Meter Data Management And Repository (MDM/R); Draft – June 1, 2006*"[13] for guidance in this area.

In their proposal, bidders shall define whether or not their AMI Master Control Computer includes an implementation of the so-called *California Meter Exchange Protocol* (CMEP)[14] for data export to an external MDM/R system, which revision levels of CMEP have been implemented, and any variants of this protocol that have previously been implemented for other clients (e.g. the San Diego Gas & Electric variant).

The Ministry's export format and protocol requirements are, at present, published in draft form within IESO Specification 9027, *Meter Data Management and Repository*

[13] This document is posted electronically on the Ministry of Energy's website at URL: http://www.energy.gov.on.ca/english/pdf/electricity/smartmeters/MDMR%20Functional%20Specifications.pdf

[14] California Meter Exchange Protocol (CMEP), Version 1.10, available online at URL: http://www.sce.com/NR/rdonlyres/33CB7D2C-5ECB-41D8-9FAF-DDA5096CFE93/0/CAMeteringExchangeProtocol.pdf

– *Technical Interface Specifications*[15] – the onus is on bidders to obtain and review changes and updates to this specification before submitting their proposal. In the event that the referenced IESO Specification 9027 is not finalized by the due date for proposals (as stipulated in Section 3, *Calendar of Events*, on page 9 herein), bidders shall stipulate whether the bid price includes software upgrades as may be necessary to provide a compliant interface to the provincial MDM/R entity.

Note: Where bidders have arrived at a particular understanding or clarification of the export function outside of what is contained in IESO Specification 9027, the specific question that was posed directly to the IESO's *Smart Metering System Implementation Program* (via URL: http://www.smi-ieso.ca/Contact_Us/) and the received e-mail reply shall be included within the bidder's proposal.

London Hydro expects that AMI Acceptance Testing (as described in Section 6.6 on page 76 herein) will include testing (in cooperation with the MDM/R agency) to demonstrate compliance of the AMI's export format and protocol with IESO Specification 9027 (and that the bidder's pricing will include adequate allowance for this activity).

6.2.8.5 Integration with London Hydro's Corporate Computer Systems

The proposed AMI system will be required to interface with London Hydro's operational systems. Some of the presently known system integration needs are defined in Section 6.2.9, *Mandatory Value-Added Functionality* (see page 57) and Section 6.2.10, *Discretionary Value-Added Functionality* (see page 60) herein. Others will emerge in future as the technology is leveraged to tomorrows business needs.

Please provide a detailed description of any existing integration interfaces with specific products in the indicated categories and state whether these are provided as part of the proposed solution or require additional licensing.

If direct access to the AMI system's data store (such as a database) is provided as a method of interfacing with other systems, describe how accuracy and integrity of the extracted data would be assured.

If application programming interface (API) access is provided as a method of interfacing, provide details of the programming languages and/or development environments that are supported for use with the API.

If a process of data export/import via files is provided as a method of interfacing, provide details of file format(s) available and how the import/export process is automated.

[15] IESO Specification 9027, *Meter Data Management and Repository; Technical Interface Specification*; DRAFT Version 2.0; Released July 31, 2007; available online at URL: http://www.smi-ieso.ca/MDMR_Design/

For all system interface methods provided by the proposed system, the vendor should state the type of data accessible via the interface and indicate whether the interface is guaranteed to remain compatible with future system enhancements or upgrades. Detailed documentation of the supported system interfaces is a required component of proposed solution.

6.2.9 Mandatory Value-Added Functionality (Level 4A)

6.2.9.1 General

London Hydro wishes to leverage the investment in Advanced Metering Infrastructure as the foundation for other automated functions that will improve the organization's effectiveness, improve its customer service, or both.

The value-added functionality considered *mandatory* are listed below. By mandatory, it is meant that London Hydro fully expects the described functions in the delivered system. For those that don't presently exist, an adder price and functional specification (preferable organized as per ANSI/IEEE Standard 830, *IEEE Guide to Software Requirements Specifications*) shall be included in the bid submission.

- Outage management, also referred to as service interruption and restoration reporting (as described in Section 6.2.9.2 below);
- Quality of supply voltage monitoring (as described in Section 6.2.9.3 below);
- Bi-directional revenue meter support (as described in Section 6.2.9.4 below); and
- Meter phase registration failure detection (as described in Section 6.2.9.5 below).

Functional descriptions and system requirements are outlined in the subsections that follow:

6.2.9.2 Outage Management System Interface

London Hydro intends to use the AMI system as an input mechanism to an outage management system. Often when there is an extensive outage, the Control Room is inundated with telephone calls from customers simply wishing to report that they are experiencing a service interruption. If the Control Room Operators were to respond to this burst of telephone activity, then they would be distracted from determining the extent of the service interruption, likely location of failed distribution element, and communicating with Operations trades staff to isolate the problem and undertake remedial repairs. Customers that can't reach the Control Room via telephone become understandably frustrated.

London Hydro's vision of an effective outage management system and its interconnection to other corporate computer systems is depicted in Figure 6-16 below.

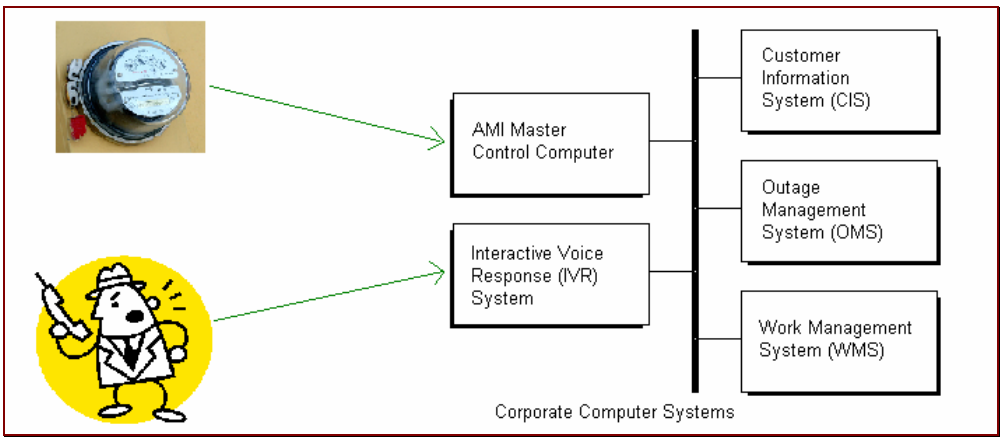


Figure 6-16, Interconnection of AMI to Outage Management System

Note: There are various visions within the industry as to how trouble call / outage management should operate. Some are consistent with London Hydro's vision, while others are inconsistent. It is important to understand London Hydro's vision so as not to provide too much or too little functionality.

Note: The CIS, OMS, WMS and IVR systems illustrated in Figure 6-16 above are not part of this procurement. London Hydro is seeking an AMI Master Control Computer with an interface to drive an external Outage Management System (OMS).

The overall customer service objective is as outlined following:

- On the occurrence of an outage incident, the affected Smart-meters would immediately report a "loss of voltage" event to the AMI Master Control Computer.
- IVR technology would be used to intercept customer calls to the Control Room with a dynamic message (e.g. London Hydro is presently experiencing problems in the Westmount area, and crews have been dispatched – if you are calling about another matter, please dial "9").
- The actual logic that occurs between the service interruption incident report in the AMI Master Control Computer and the IVR message would be carried out by a combination of the CIS, OMS and WMS (to identify those revenue meters being exchanged due to seal expiry, service upgrade, etc).
- To complete the logic, the Smart-meters need to report a "restoration of voltage" event to the AMI Master Control Computer when service has been restored.

To be useful for this purpose, the revenue meter needs to be able to transmit a so-called *last-gasp* "loss of voltage" message, and all messages from the affected portion of the service territory need to be received by the AMI Master Control Computer within one minute (1 min).

In their proposal, suppliers shall include a calculation of the system response time to an unplanned outage of one of London Hydro's typical 16/27.6Y kV distribution feeder circuits. The assumptions used (e.g. number of revenue meters per regional collector, communications medium error rate giving due consideration to the fact that

unplanned outages tend to occur during inclement weather, message collisions for contention-based media, etc.) shall be clearly stated.

Note: Bidders not including system response time information in their submissions will be assumed not to have outage management functionality in their offering.

For the purpose of calculating their response times, a typical feeder circuit outage may be assumed to involve 2,500 customers (revenue meters) in a 7 sq. km. geographic area.

6.2.9.3 Quality of Supply Voltage Reporting

London Hydro is mandated to supply customers within the voltages given in Table 3, *Recommended Voltage Variations Limits for Circuits up to 1000 V, at Service Entrance*, of CSA Standard CAN3-C235-83 (R2006), *Preferred Voltage Levels for AC Systems, 0 to 50 000 V*. Voltages outside this range may be indicative of transformers with inappropriate tap settings, the need for reactive power support on a feeder circuit or supply substation, excessive voltage drop on a feeder circuit, inappropriate control settings on under-load tap-changers (ULTC) in a supply transformer station, etc.

It is more effective for system planners and control room operators to assess the underlying source of the problem if the symptoms can be presented visually against a spatial background, e.g. high-light all buildings with voltages outside the *normal* operating ranges in yellow, and all buildings with voltages outside the *emergency* operating ranges in red.

Note: The relationship between customer, structure (building), revenue meter, municipal address, and supply transformer designation is presently maintained electronically in London Hydro's Customer Information System (CIS). The connectivity model (i.e. the relationship between substation, distribution circuit, transformer, and operating devices such as switches, fuses, separable connectors, etc) is presently maintained electronically in London Hydro's Automated Mapping / Facilities Management (AM/FM) system.

Whereas the AM/FM system is an appropriate engine for the spatial presentation of our-of-limit service entrance voltages, it requires the export of hourly average voltage data from the AMI system. The AMI master control computer shall therefore:

- maintain a report-by-exception queue of out-of-limit service entrance voltages (based on hourly average voltage measurements at the meter) – loss of supply events shall not also invoke an under-voltage exception report.
- upon request, provide 24-hours of hourly average voltage readings for every meter.

In their proposal, bidders shall describe their implementation of this function, the method of calculating steady-state voltage, the method for setting / modifying alarm limits, and the organization of voltage readings in the AMI Master Control Computer database, and the export options for transferring out-of-limit voltages to external computer systems (e.g. AM/FM or GIS systems).

6.2.9.4 Bi-directional Revenue Meters

Residential and small commercial customers with grid-connected local generation (e.g. solar panels, wind turbines, biomass digester generators, etc.) have bi-directional revenue meters installed. Such revenue meters simply have dual internal registers to separately record imported energy and exported energy.

Bidders shall include a data sheet and Measurement Canada *Notice of Approval* (NOA) reference number for their bi-directional revenue meter. If any special configuration effort (i.e. anything other than the so-called *plug and play*) is required of the user to provision these meters into the AMI and support transport of two-channels of interval meter readings to the AMI Master Control Computer, these (work-around) measures shall be described in the bidder's proposal.

While presently there are less than ten (10) dual-register energy meter installations within London Hydro's service territory, probably an ultimate penetration of one-hundred (100) such embedded micro-generation installations (with their associated dual-register revenue meters) is an optimistic future population target for the design of the AMI system.

Note: It can be inferred from Section 1.0, *Application of Specification*, of Ontario Ministry of Energy publication "*Functional Specification for an Advanced Metering Infrastructure (AMI)*" that the meter readings received from such bi-directional meters are not to be exported to the central MDM/R. Rather, the communications to these revenue meters and readings and other information received from such meters shall be considered an extension of the functionality previously defined in Section, 6.1.7.2, *Revenue Meters beyond Scope of Provincial AMI Specification*, herein.

6.2.9.5 Meter Phase Registration Failure Detection

The AMI system shall detect and report on the failure of a polyphase electric revenue meter to register consumption on any phase. There is no need to distinguish between failures of phase voltage or phase current sensing; rather only to report the failure of phase registration.

Bidders shall describe how this feature is implemented, and how the loss of a phase is detected by the AMI equipment. Bidders shall describe if and how the AMI equipment detects the difference between a single-phase electric service interruption on the distribution system (i.e. loss of registration on both current and voltage sensing on the affected phase) and a phase registration failure.

6.2.10 Discretionary Value-Added Functionality (Level 4B)

6.2.10.1 General

London Hydro wishes to leverage the investment in Advanced Metering Infrastructure as the foundation for other automated functions that will improve the organization's effectiveness, improve its customer service, or both.

The value-added functionality considered *discretionary* is listed below. By discretionary, it is meant that London Hydro may elect to adopt the supplier's offering outright or in a limited deployment based on the value proposition offered (i.e. the cost of the feature versus London Hydro's valuation of the potential productivity or customer service gains) and the maturity of the technology.

- Remote disconnect of service (as described in Section 6.2.10.2 below);
- Meter tamper detection (as described in Section 6.2.10.3 below);
- Automated reading of water meters (as described in Section 6.2.10.4 below);
- In-home energy use displays (as described in Section 6.2.10.5 below);
- Demand response / load management (as described in Section 6.2.10.6 below);
- Prepayment metering (as described in Section 6.2.10.7 below);
- Remote device diagnostics and maintenance functionality (as described in Section 6.2.10.8 below);
- Meter configuration management (as described in Section 6.2.10.9);
- On-demand meter reads (as described in Section 6.2.10.10);
- Data transfers to foreign AMI master control computers (as described in Section 6.2.10.11); and
- Check meter discrepancy reporting (as described in Section 6.2.10.12 below).

Note: If a supplier does not include one or more of the discretionary value-added functions in its product offering, this will not have a negative impact on the overall product evaluation. However, if two competing baseline systems are evaluated to be equal, then the discretionary value-added functions may be introduced as a deciding factor.

Functional descriptions and system requirements for the various discretionary value-added functions are outlined in the subsections that follow:

6.2.10.2 Remote Disconnect of Service

Disconnecting a customer's service (by removing the revenue meter and placing a protective cover over the meter base) for non-payment of bills can be a cumbersome and costly process for a utility. It usually takes a minimum of three trips for a service person – one trip to leave a final notice, the second trip to disconnect the meter, and the third trip to reconnect the meter once payment is received. If properly deployed (e.g. in high-turnover units, such as rental housing, and at meters with a history of past-due bill payments), a *remote disconnect / remote reconnect of service* accessory can provide utilities with the opportunity to more effectively manage delinquent accounts.

Based on the incremental cost and means of implementation, London Hydro may be interested in a selective deployment of single-phase revenue meters with an "under-

glass, remote disconnect / remote reconnect of service" feature. Required features of such an option are identified below:

- The internally-mounted magnetic latching relay / switch shall be 200 A rated (both continuous and load-interrupting);
- Remote disconnect shall be achieved via the three step sequence typical of supervisory control operations (i.e. the selection of a point for a user control action shall result in a visual feedback at the user interface. This positive feedback to the user shall signify that the end-point device is ready to accept a control action. The results of the control action shall be displayed only after a status change has been received from the end-point device);
- Load-side voltage shall be checked prior to execution of a re-connect command so that the switch does not close on an independent power source; and
- Control operations shall be restricted to only certain individuals assigned such privileges.

Note: As a policy matter, London Hydro insists that customers be at home when power is restored. As such, special arming circuits to overcome the situation where a combustible object is lying on the stove and the stove is left in the "on" position, thereby setting up the potential for a fire, are not required.

Associated with each remote disconnect / remote connect action, the AMI system shall log that connect / disconnect action, and retrieve the meter readings at the meter (along with the usual time-stamp).

6.2.10.3 Meter Tamper Detection

Further to the requirements outlined in Section 3.9.1.3 of the Ministry of Energy's AMI functional specification, bidders shall describe the features available in their product offering for detecting meter swapping (customers go to a vacant property or house up for sale, steal the meter, and install it at their house) and also for locating stolen meters.

6.2.10.4 Automated Reading of Water Meters

Although London Hydro's contract meter readers additionally read the water meters within each premise, and London Hydro bills customers for water consumption on behalf of the City of London, specification, ownership and maintenance of water meters (including AMR accessories such as encoded registers / meter transceiver units) will continue to reside with the City of London. Although a number of water meters will be outfitted with water meter transceiver units as a pilot project within the Smart-metering initiative, selection of the meter transceiver unit technology and development of a business case for expanding the water meter initiative will reside with the City of London.

Bidders are requested to include with their proposals a complete description of their water meter transceiver unit (WMTU), the water meters for which the WMTU is

designed to operate (or better yet a list of exclusions for proclaimed universal designs), and the communications and product longevity limitations of their WMTU product.

Note: The WMTU descriptions should include adequate coverage of the following topics, upon which the adequacy of the design will be gauged: (i) transmitting power and architecture, (ii) battery life, (iii) method of analogue-to-digital conversion (and reliability thereof), (iv) method of environmental protection (e.g. conformal coating), and (v) the method of mechanically interfacing the WMTU to the water meter.

Design preferences for the WMTU are listed below:

- The WMTU shall have a ten year (10 yr) minimum guarantee of hardware and batteries. Longer guarantees whether prorated or unconditional will be strongly considered in the selection process.
- The WMTU shall not require reprogramming, if the battery discharges before it is replaced. Volatile memory is not preferred.
- Provision shall be made in the WMTU for the use of seal wires to further secure the unit to the water meter housing.

Additional value-added flow information that the WMTU can inherently provide (tamper detection, back flow detection, leak detection, etc.) shall also be described.

Note: Even though the interval data from the electric meters will be exported to the provincial MDM/R, the odometer readings from the water meters will continue to be exported into London Hydro's CIS system for customer billing.

6.2.10.5 In-Home Energy Use Displays

Utilities can enhance customer relations by selling display units to customers that provide up-to-the-minute monitoring of power consumption, in dollars and cents. This can be used as an energy management tool and allows customers to verify and reconcile bills.

The second-generation concept for an in-home energy use display that London Hydro is pursuing is depicted in Figure 6-17 below. The key (information exchange) design elements are:

- The in-home energy use display receives dynamic (or nearly dynamic) electricity consumption information from the revenue meter or AMI;
- There are provisions in the AMI Master Control Computer so that each licensed energy retailer will have secure access to their own (and only their own) customers to provide downloadable contract energy rates to the end-use customer's in-home display.
- There are provisions in the AMI Master Control Computer for London Hydro to provide downloadable fixed and volumetric electricity tariffs to the end-use customer's in-home display.

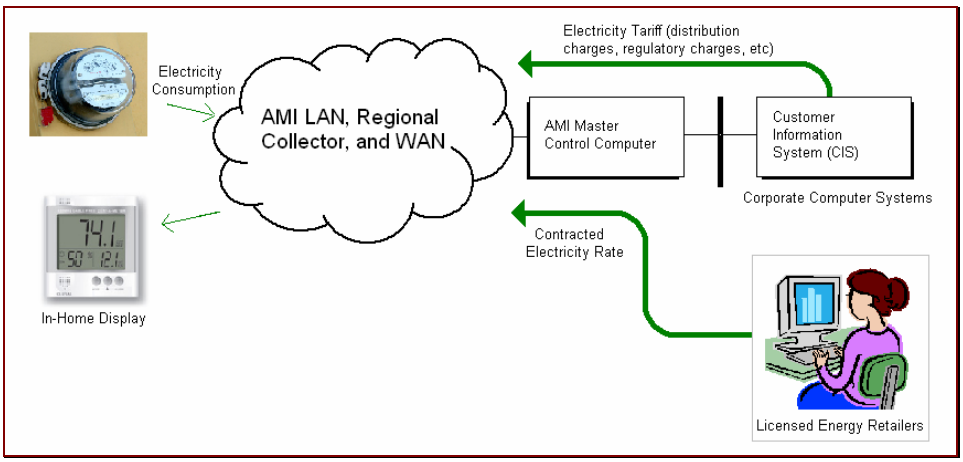


Figure 6-17, Conceptual Data Transfer Schematic for In-Home Display

The in-home energy use display shall be a small, attractive graphic LCD display which may be wall-mounted or set on a counter. The preferred presentation on the default home display page will be of two (2) speedometers – the first showing energy consumption on a relative basis, and the second showing energy price again on a relative basis.

Bidders with an in-home energy use display accessory that generally conforms to the design principles outlined above shall include literature or descriptions of their product, or a white paper outlining their plans if the product is still under development.

6.2.10.6 Demand Response / Load Management

London Hydro is interested in leveraging the AMI communications infrastructure to provide its customers with demand response / load management offerings, such as Smart-thermostats, and remote control switches for heat pumps, air conditioners, pool pumps, and water heaters.

Bidders with AMI designs that can support third-party demand response / load management devices shall identify the products so supported, the specific manner in which they interface with the AMI, and reference information where such accessories have been successfully installed elsewhere. If third-party relationships are in place but products are still under development, a white paper may be submitted.

6.2.10.7 Prepayment Metering

Prepayment metering (also referred to as "*pay-as-you-go*" metering) in its simplest form refers to paying for electricity, gas or water before it is used. Although a lesser more limited residential service (that would likely have its own rate class), the advantages of prepayment metering to the customer include budget management, awareness and control of energy usage, no security deposits, and in the case of delinquent customers, no utility surcharges or waiting for reconnection.

The basic elements of a prepayment metering system include (but are not necessarily limited to) the following:

- Prepayment meter – the prepayment meter replaces the customer's conventional meter and contains an internal means (wireless or power-line carrier over household wiring) for communications with the CIU, and an internal automatic disconnect switch that opens or closes as the meter depletes or recharges the energy credits respectively. The relay / switch shall be 200 A rated (both continuous and load-interrupting). The prepayment meter shall be a self-contained, socket-style, energy meter available in both a single-phase style (240 V, 200A; ANSI Form 2S) for residential dwellings and a network style (120 V, 200 A; ANSI Form 12S) for apartment buildings.
- Consumer interface unit (CIU) – the CIU is a small wall-mounted or counter-top panel with a keypad and display (LCD or similar) that automatically communicates with its associated prepayment meter and enables the consumer to monitor consumption and view remaining credits to their meter.

  Note: It is presumed that with prepayment metering, the consumer interface unit and an in-home energy use display (previously described in Section 6.2.10.5 on page 63 herein) are one in the same.
- A two-way communications system between the prepayment meter and AMI master control computer.
- Host prepayment management software (which may be resident on the AMI Master Control Computer or another processor) that interacts with the Customer Information System (to obtain electricity tariffs), licensed energy retailers (to obtain commodity costs), and the prepayment stations within the community whereby consumers buy electricity in advance.

Based on the incremental cost, product sophistication (i.e. means, robustness, and flexibility by which customer can procure electricity), and means of implementation, London Hydro may be interested in a selective deployment of prepayment metering.

Desirable features of the prepayment subsystem include:

- The prepayment meter shall predict the day on which credits will be exhausted based on existing rates of energy consumption. The CIU shall continuously blink and emit a regular "chirp" (e.g. hourly) when the credit remaining is than say five times the amount used on the previous day.
- Cold weather protections shall permit continued consumption with service limiter constraints. If, for example, during the designated winter months the electricity demand exceeds a designated level (e.g. 2,000 W) after the purchased consumption is exhausted, the CIU shall provide an audible warning and then cut-off power for a designated period of time. At the end of that time, the meter will check to determine whether the demand has been reduced below the permitted levels. Any electricity consumption after the credit has been depleted during the winter months shall accumulate as a negative amount on the meter and be subtracted from any new electricity procurements.

- A preferred option shall allow the utility to configure the system to provide a *customer-friendly* service disconnect option, i.e. in the event of zero credit during the evening or weekend, service continuity would be maintained until a time during normal weekday working hours.

Bidders with available prepayment functionality that generally conforms to the design principles outlined above shall include literature or descriptions of their product, or a white paper outlining their plans if the product is still under development.

6.2.10.8 Remote Device Diagnostics and Maintenance Functionality

The AMI system shall support the establishment of a real-time, two-way data connection between a corporate workstation and a revenue meter to allow a meter technician to verify proper electric service at the meter site, to diagnose possible equipment failures or system problems, and to make limited meter configuration changes without dispatching field personnel to the site.

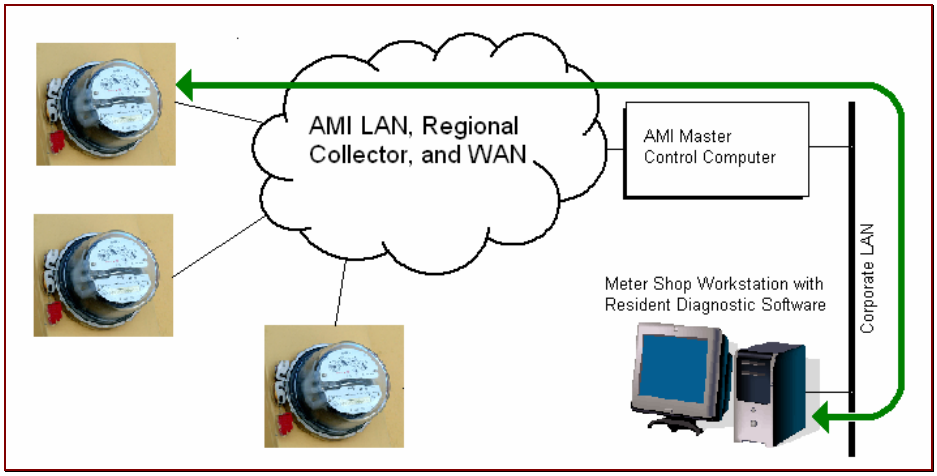


Figure 6-18, Support for Remote Meter Diagnostics & Maintenance Session

Desired on-line functionality includes, but is not necessarily limited to, the following diagnostic screens:

- real-time phasors diagram illustrating the direction and angle of power flow;
- power quality event log entry reporting (voltage sags, surges, interruptions and outages);
- Meter diagnostic event log entry reporting;
- Enable / disable meter service tests; and
- Set or modify thresholds within the meter.

Bidders with conforming product offerings shall include literature or descriptions of their product (including screen prints to clarify the product features), or a white paper outlining their plans if the product is still under development.

Note: One of London Hydro's goals is continued improvement in operational effectiveness via adoption of state-of-the-art technologies. In cases where the proposed AMI system does not support the remote diagnostics and maintenance functionality outlined above (or a reasonable variant thereof), London Hydro will determine the cost of "truck rolls" and assign this amount as a component in the overall projection of system ownership costs.

6.2.10.9 Meter Configuration Management

The AMI system shall include the functionality identified below to manage the AMI revenue meters:

- Track the version of the firmware at each AMI meter. The version of the firmware shall be clearly linked with the meter ID;
- Remotely configure each meter by downloading the (non-seal related) meter configuration parameters, e.g. power quality reporting thresholds. The configuration shall be executed either on an individual AMI meter basis or for a group of AMI meters basis. The Operator shall be able to designate any number of meters to form groups to facilitate the broadcast of information for those meters, and to receive acknowledgement that the selected meters have been reconfigured.
- Remotely upgrade firmware as needed.

Note: One of London Hydro's goals is continued improvement in operational effectiveness via adoption of state-of-the-art technologies. In cases where the proposed AMI system does not support the meter configuration management functionality outlined above (or a reasonable variant thereof), London Hydro will determine the cost of "truck rolls" and alternative records systems and assign this amount as a component in the overall projection of system ownership costs.

6.2.10.10 On-Demand Meter Reads

The AMI system shall allow a Customer Service Representative (CSR) to request a retrieval of current data collected in a specific meter, including electric consumption, power quality information and the meter ID. The requested data shall be presented within one minute of the request.

6.2.10.11 Inter Master Control Computer Communications

London Hydro's service territory, as depicted in Figure 6-1 on page 30 herein, is entirely surrounded by Hydro One Networks' service territory. In the periphery area of the service territory boundaries, the customer density is very sparse for both LDC's – refer to the revenue meter density maps included as Appendix C.

Depending upon communications media selected by each LDC, the range of regional collectors installed near the periphery may extend into each other's service territory resulting in duplication of resources and extraordinary costs. The lowest cost arrangement will be one whereby London Hydro's AMI system can provide a transport function for a limited number of Hydro One Networks customers between their respective revenue meters and AMI master control computer.

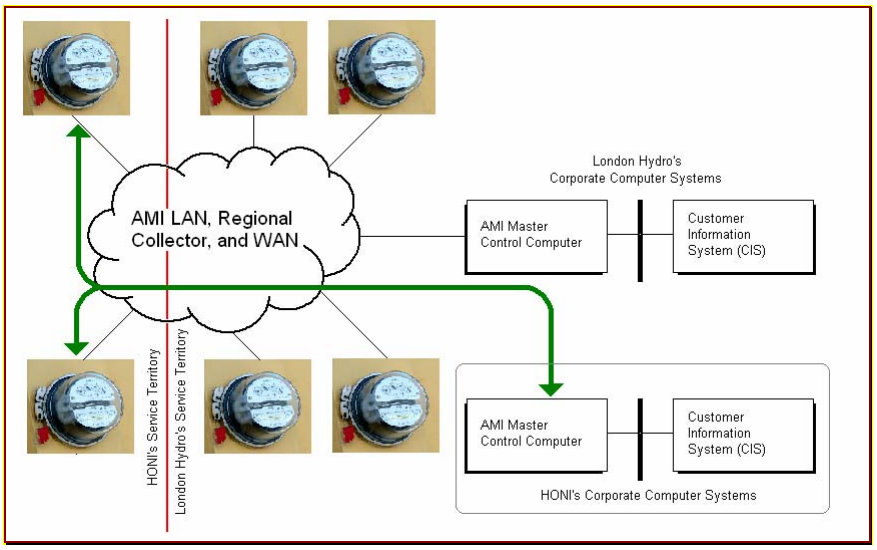


Figure 6-19, Transfer of Meter Readings between Adjacent LDC's

Note: In a reciprocal arrangement, it is expected that meter reading data for a limited number of London Hydro's customers (located on the periphery of the service territory) would be transported via HONI's communications infrastructure to London Hydro's AMI Master Control Computer.

Note: An alternative approach may be for London Hydro to export the meter readings from Hydro One Networks customers directly to the provincial MDM/R agency. However, it is unknown whether the eventual design of the MDM/R will accept meter readings from one LDC's AMI and customer information from another LDC's CIS.

Bidders with systems that can support this functionality shall include a description of the manner in which they envision meter reading data to be transferred between AMI Master Control Computers (i.e. ICCP or other recognized methodology).

6.2.10.12 Check Meter Discrepancy Reporting

Some multi-tenant complexes (e.g. Covent Gardens Market, Westmount Shopping Mall, etc.) with accessible low-voltage busway and distributed low-voltage tenant metering systems are also equipped with a so-called "check meter" on the main service entrance to indicate that a greater amount of electric energy is being used within the complex than is shown by the sum of the individual tenant meters. Discrepancies can be indicative of failure of a tenant meter or inadvertent power diversion.

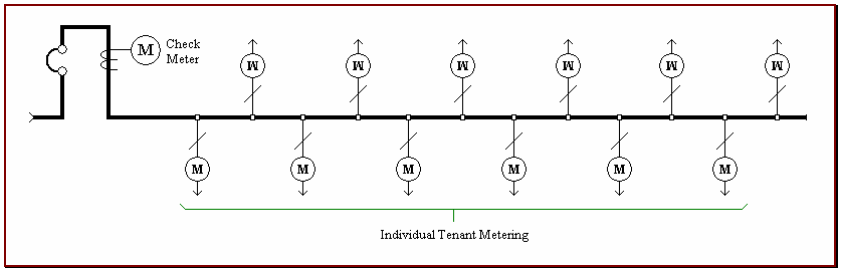


Figure 6-20, Typical Check Meter Installation

Note: The readings from the check meter are not used for billing purposes (but will be used to support "dispute" investigations carried out by Measurement Canada).

Where "check metering" installations exist, the AMI Master Control Computer shall compare the energy consumption reading received from the check meter with the sum of the readings received from the individual downstream meters using a standard "propagation of uncertainty" analysis,[16] and report anomalies.

Note: For this function to work correctly, it will be necessary to define (or import) the service multipliers (connected ratio for instrument current transformers and connected ratio for instrument voltage transformers) for the transformer-rated meters within the overall metering installation.

6.3 Operational Requirements for AMI

6.3.1 Expandability (Scalability) Requirements

The AMI Master Control Computer and WAN interfaces shall have sufficient inherent expandability to sustain the system for at least ten (10) years, based on the assumptions regarding growth of the meter population as listed below:

- The existing electric meter population (as given in Table 6-3, Table 6-4 and Table 6-5) is approximately 140,000;
- Approximately 2,400 new services (with associated revenue meters) are added each year;
- If the provincial government mandates conversion of bulk metered apartment buildings to individual tenant meters (via such instruments as Ontario proposed draft Regulation, *Installation of Smart Meters and Smart Sub-Metering Systems in Condominiums*), the conversions within 690 buildings will see the addition of 29,388 tenant meters.
- A 3% allowance shall be provided for anticipated other factors.

Based on the foregoing, the AMI system shall be scalable to at least 200,000 electric metering points

6.3.2 System Availability (Reliability) Requirements

6.3.2.1 General

Availability is defined in the following as the ratio of uptime to total time (uptime + downtime):

$$A = \text{uptime} / (\text{uptime} + \text{downtime})$$

[16] NIST Technical Note 1297, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; Barry N. Taylor and Chris E. Kuyatt; 1994. Electronic version of document available online at URL: http://www.physics.nist.gov/Pubs/guidelines/contents.html

and is normally expressed as a percent (of total time).

Downtime normally includes corrective and preventive maintenance. When system expansion activities compromise the user's ability to operate apparatus via the system, this may also be included in downtime.

6.3.2.2 AMI Master Control Computer Availability

The AMI master control computer (with its associated redundant configuration and automatic failover functions) shall provide a overall availability of 99.9% or greater. Bidders shall provide supporting predicted availability calculations within their proposals.

6.3.2.3 Regional Collector Availability

The regional collector shall have a minimum MTBF of no less than 15 years.

Bidders shall describe the burn-in production tests that are carried out to minimize infant mortality failures.

6.3.3 Maintainability

Maintainability requirements address the ease and efficiency with which servicing and preventive and corrective maintenance can be conducted; i.e., the ability of a system to be repaired and restored to service when maintenance is conducted by personnel of specified skill levels and prescribed procedures and resources.

6.3.3.1 Revenue Meter Maintainability

In general, revenue meters are disposable items, meanings it is generally more cost-effective to replace malfunctioning units than to repair them. London Hydro's interest is in selecting a revenue meter (complete with AMCD unit) with design and assembly features that is seen as robust and therefore likely to result in the lowest maintenance costs.

Upon request, bidders shall provide an (unsealed) electric meter complete with AMCD for examination. Desirable features and attributes include:

- Surface-mounted circuitry
- Clean Printed Circuit Board (PCB) layout
- Elimination of batteries by utilizing rechargeable capacitors
- Circuit-stability features to ensure performance over a range of temperatures and humidity conditions as are experienced in Ontario
- Design aspects including technology, ergonomics, usability, human factors, and material technology

Undesirable features and attributes include:

- Jumpers, bypasses or cut traces on printed circuit boards;
- Reroutes and kluges on the PCB
- Use of obsolete parts and components
- Batteries or items that require site visits for replacement and maintenance
- Poor shielding and isolation
- Poor grounding and RF interference for the communications components
- Unstable oscillators and displays that may be affected by temperature or humidity
- Prototypes and untested components
- Weak or unstable connections
- Clumsy, hard to reach or illogical controls
- Poor weather-proofing

6.3.3.2 Regional Collector Maintainability

Regional collectors, communications transmitters (if a private wireless WAN is offered) and signal injectors (if a PLC system is offered) shall conform to Chapter 2.0, *Design for Maintainability*, of US Department of Energy Handbook 1140-2001, *Human Factors / Ergonomics Handbook for the Design for Ease of Maintenance*.[17]

Note: Bidders may be requested to provide samples of such devices for disassembly and assessment by the bid evaluation panel.

Note: Bidders may also be requested to provide regional collector documentation (manuals, schematics, diagrams, etc.) for readability and thoroughness.

6.3.4 Response Requirements

6.3.4.1 Revenue Meter Interrogation

In addition to meeting the meter interrogation response requirements in the baseline Ministry of Energy specification, the AMI shall be sufficient to meet or exceed the performance requirements given in:

- Section 6.2.9.2, *Outage Management* – (see page 57 herein)
- Section 6.2.10.10, *On-Demand Meter Reads* - (see page 67 herein)

6.3.4.2 Man-Machine Interface Performance

For workstation display units, rapid, error-free access to the information required for the task shall be accomplished by ensuring that system response to any query is less

[17] This chapter of the handbook is posted electronically on the US Department of Energy's website at URL: http://www.eh.doe.gov/techstds/standard/hdbk1140/HDBK11402001_Part2.pdf

than 2 seconds and that user feedback to control action is less than 0.2 seconds or faster wherever possible.[18]

6.3.4.3 Disaster Recovery

Within the AMI master control computer system, for failure of any hardware element of the primary half-system, the secondary half-system shall be synchronized and ready to automatically assume full control within five minutes with no loss of meter reading data. Conversely when the faulty hardware element has been replaced, the primary half-system shall be brought to full synchronized operation within sixty minutes.

In the unlikely event that the entire AMI master control computer system, or the work area facility, becomes unavailable (e.g. fire, sabotage, etc.), it shall be possible to reconstruct a working AMI master control computer system (from backup media) within four hours.

6.3.5 Spare Parts

Bidders shall provide as part of the system proposal, a list of quantities of spare parts calculated to be necessary to meet the specified availability and maintainability requirements.

Spare parts shall be grouped by equipment category (i.e. Smartmeter, regional collector, AMI master control computer).

The spare parts list shall include the part's generic name or description, its trade name, manufacturer's name, manufacturer's part number, list price, and recommended quantity.

In establishing the quantities of spare parts, the supplier shall consider the time required to return a failed component (field and/or factory service) to a serviceable condition.

The maintainability of equipment is reflected in a figure of merit called mean-time-to-repair (MTTR). The MTTR values used in the supplier’s availability computations shall be based to the maximum extent possible upon maintenance experience.

MTTR is the sum of administrative, transport, and repair time. Administrative time is the time interval between detection of a failure and a call for service. Transport time is the time interval between the call for service and on-site arrival of a technician and the necessary replacement parts. Repair time is the time required by a trained

[18] Elaboration of requirements can be found in Table 6 and Table 7 of U.S. Nuclear Regulatory Commission publication NUREG/CR-2496, *Human Engineering Design Considerations for Cathode Ray Tube-Generated Displays*; April 1982.

technician, having the replacement parts and the recommended test equipment on-site, to restore nominal operation of the failed equipment.

6.3.6 Special Provisioning and Diagnostic Tools

As noted in Section 2.4 (see page 5 herein), London Hydro's Electric Meter Shop has accredited meter verifier (AMV) status for both its own revenue meters and those of clients (i.e. neighbouring LDC's). A special computer-based support system is used within the Department to both interface with the automated meter test consoles (for the management of meter test certificates) and support operations in accordance with the federal accreditation requirements and the work procedures contained within the Department's quality management system.

Many of the Department's field operations also require interactions with the corporation's Customer Information System (CIS). The "meter exchange process", which will be used extensively for the mass deployment of smart-meters, is depicted in Figure 6-21 below.

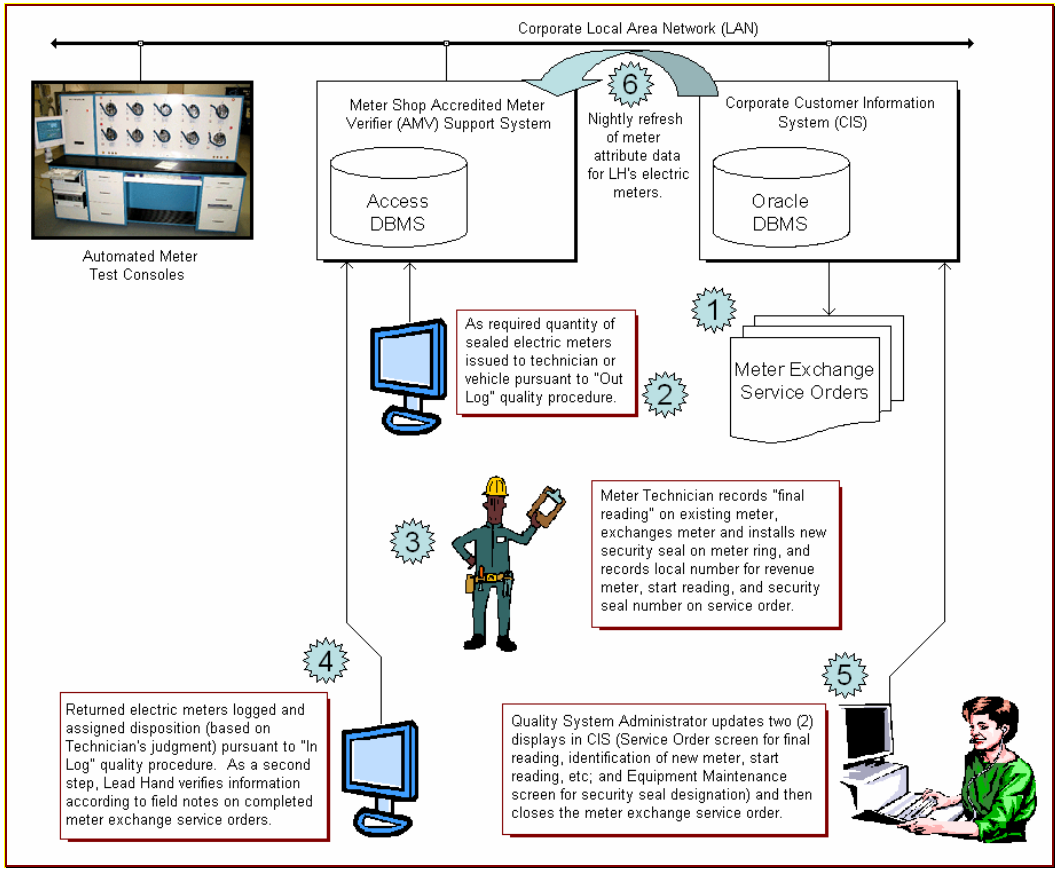


Figure 6-21, Process Diagram for Single-Phase Meter Exchange

Note: Bar-coding is already used extensively for the revenue meters and within the AMV support system as an aid to effectiveness.

For the purpose and duration of the mass smartmeter deployments, London Hydro is interested in obtaining a number of mobile provisioning tablets equipped with bar-code readers that will allow field staff to capture required information for the meter exchange service orders and any other configuration information required for the AMI master control computer.

Also of interest is a provisioning tablet feature whereby field staff can carry out a quick end-to-end test to verify that the communications signal strength is strong and that the smart-meter is successfully communicating with the AMI master station.

Bidders shall include descriptions and unit pricing for their recommended mobile provisioning and diagnostic tools.

Note: Bidders may also consider the option of have the developer of the existing AMV Support System expand the functionality of this system to encompass the mobile provisioning requirements. Alternatively, as London Hydro will also be upgrading its existing AM/FM system to the Intergraph G/Technology™, bidders may wish to offer a version of Intergraph's workforce management tools.

Note: In assessing deployment costs with an AMI technology, London Hydro will be considering the system features and tools that provide for an expedient and reliable meter deployment. For example, a solution set that provides the meter technician with verification of communications with the AMI master station within say one-minute from initial energizing has a lower projected deployment cost than a solution whereby the meter technician has to wait until the end of a reporting interval (i.e. fifteen minutes or one hour) for such verification.

6.3.7 Backup Interval Data Collection

The bidder shall indicate whether or not the AMI system provides a way to recover meter register data if the AMI communications (LAN or WAN) has failed, for example an optical port on the meter (that conforms to ANSI Standard C12.18-1996, *Protocol Specification for ANSI Type 2 Optical Port*) in conjunction with a hand-held terminal.

6.4 Documentation Requirements for AMI

The documentation shall be sufficient for operation and maintenance (including upgrades) of the AMI system, as well as any special provisioning / diagnostic tools associated with the AMI.

London Hydro's expectations for supporting documentation are outlined in the subsections that follow.

6.4.1 Quick Reference Guides

Quick reference guides (or so-called *operator cards*) shall be available to provide a convenient reference for guiding the user in the installation and basic operation of the system and/or unit. The operator cards contain abbreviated pertinent information provided in the operating and service manuals and are useful to facilitate operation of the system and/or unit in customer locations.

The deliverables shall include five (5) printed and bound sets of the quick reference guides, and one electronic copy (preferably in PDF format) on a CD-ROM.

6.4.2 Operating and Service Manuals

Operating and service manuals for the regional collectors, Smart-meters, and any other tools for provisioning or otherwise maintaining the AMI shall contain, as a minimum:

- information needed to perform scheduled preventive maintenance, fault isolation, and removal and replacement procedures for units down to the assembly or chassis-mounted component level.
- parts lists, component location diagrams, and schematic diagrams to aid in component level repair when this approach is cost effective.

The deliverables shall include three (3) printed and bound sets of the operating and service manuals, and one electronic copy (preferably in PDF format) on a CD-ROM.

6.4.3 Software User Manuals

Software user manuals for the AMI master control computer, revenue meter configuration programs, and any other software tools for provisioning or otherwise maintaining the AMI shall contain, as a minimum:

- Operating system requirements (platforms, hard drive space minimum, hard drive space recommended, RAM minimum, RAM recommended);
- Installation instructions: step-by-step instructions with screen captures for reference;
- Description of software features and functions; and
- Solved example problems, or a tutorial that demonstrates the main features of the software. These need to include step-by-step user instructions, inputs, and expected outputs.

The deliverables shall include one (1) printed and bound set of the software user manuals, and one electronic copy (preferably in PDF format) on a CD-ROM.

6.5 Staff Training Requirements for AMI

The Vendor shall provide on-site training to designated London Hydro staff. Three (3) different training sessions are envisioned as outlined following:

- Installation training, for electric metering technicians that will be carrying out the field installations of revenue meters and regional collectors using the provisioning tools available. These staff will also re-calibrate and re-seal Smart-meters as required. Vendors may assume a class size of fifteen (15) students.
- General user training, for a variety of users of the AMI Master Control Computer, to extract and interpret trouble reports, carry out final meter reads (associated with

tenancy changes), to oversee meter exchanges, etc. The training shall include the functional operation and minor technical support of the installed system. Vendors may assume a class size of ten (10) students.

- System administrator training, primarily for technical staff within London Hydro's Information Systems Department. This training is expected to be comprehensive in nature and cover all aspects of the software, database management system, security, and corporate LAN interfaces used within the AMI Master Control Computer. Vendors may assume a class size of four (4) students.

  Note: London Hydro recognizes that it may be more practical to carry out certain portions of the *system administrator* training at the vendor's facilities. In this case, Vendors may assume that London Hydro would assume responsibility for all travel and accommodation expenses associated with staff training at the Vendor's site.

The Vendor shall provide one set of printed training materials for each trainee.

For on-site training, London Hydro will provide a suitable classroom facility with computer workstation equipment for each staff member participating in the training session and a computer workstation for the instructor. The room can be darkened and includes a projector as well as a whiteboard or equivalent.

Training shall be provided in accordance with a mutually agreed upon schedule.

Within the proposal, the Vendor shall provide an overview (e.g. table of contents for printed materials) of the training program that is included.

6.6 AMI Acceptance Testing

The successful vendor shall develop a formal System Acceptance Test (SAT) Plan to verify that the AMI system operates in accordance with London Hydro's specifications (which encompass those regulatory requirements of the federal and provincial governments), and the vendor's specified capabilities as set forth in their response to this Request.

The SAT Plan shall also encompass the RF (or PLC) systems and all backhaul connections. This element of the plan will test the performance of the RF carriers from the perspective of signal strength (levels) and signal clarity (signal to noise ratio) as a minimum. RF performance parameters and sufficient fade margin will be determined once the successful vendor is known. It is envisioned at this time that these parameters will be jointly determined and agreed to by the purchaser and the vendor. All parameters will be set in advance of the purchase and the vendor will need to agree to meet these parameters as a minimum expectation of satisfactory performance of the RF links. Penalty clauses may be assigned for any under-performance of the test plan specifications.

Note: For RF communications systems, London Hydro prefers testing be carried out in July or August when tree foliage has full moisture content.

The System Acceptance Test Plan shall include, as a final element, a 30-day system availability test. During the system availability test, the AMI system will not be altered in any way by either party other than normal day-to-day use. If during the 30 days of availability testing a problem is reported, the vendor shall correct and test the system. The 30-day system availability test shall start again at this point.

The structure of the SAT test plan shall generally conform to IEEE Standard 829-1998, *Software Test Documentation*.

The System Acceptance Test Plan developed by successful bidder shall be subject to approval by London Hydro.

System Acceptance Testing shall be performed by qualified London Hydro staff in the presence of a representative of the successful bidder.

6.7 Other Requirements

6.7.1 Warranties

6.7.1.1 System Level Functional Warranty (12 months)

Supplier warrants that the goods sold constitute a system suitable for the purposes articulated in the contract. The system comprises the hardware and software elements furnished by the supplier, but not elements of the telecommunications infrastructure provided by a public carrier, if any. The system shall perform and support the functions and performance required by the contract for a period of 12 calendar months following the Acceptance Test (described earlier in Section 6.6). Supplier shall be responsible for any and all necessary additions, modifications, repair or replacement of all elements of the AMI system, including revenue meters with integral communications devices, to ensure satisfactory operation and subsequent expansion of the system. Such responsibility includes, at London Hydro's option, field labour to install, remove, or modify communications infrastructure, to modify any system software, and to test such modifications to confirm that the system operates satisfactorily. London Hydro will notify Supplier promptly of any failure of the system to meet functional and/or performance requirements. Supplier shall provide, at Supplier's expense, a remedy that returns the system to full functionality without delay.

6.7.1.2 Device Level Materials and Workmanship Warranty (5 years – declining share)

All hardware and software provided by supplier shall be free of defects in materials and workmanship. Supplier shall bear a share of the cost of replacing material that is found by London Hydro to be defective, as described in this section. Supplier shall provide to London Hydro convenient and efficient instructions and procedures for shipping material to supplier for repair / replacement.

Material provided by Supplier that is found by London Hydro to be defective will be returned to Supplier within 30 days of when the defect is evident to London Hydro.

If the defect is determined to have been a fault of the Supplier, then the pro-rated sharing of expenses shown below shall apply. Supplier shall repair or replace the defective item at its expense and return it to London Hydro within 30 days. Supplier shall not be obligated to ship, repair, or replace the item at its expense if the defect is determined to have arisen from misuse, improper installation, neglect, modification, accident or exposure to adverse conditions exceeding performance levels required by applicable specifications.

In the 5 year period of use and operation that follows the Acceptance Test, failures of any element of the system (including electric revenue meters) exceeding one-half percent (½%) of devices per rolling 12-month interval are considered excessive, and become the responsibility of Supplier. Supplier shall bear a pro-rata share of the material and change-out labour costs to remedy such failures in accordance with the following schedule:

Table 6-7, Cost Sharing Schedule for Warranty Repairs

Within 12 months of Acceptance Test	100%
Within 13 – 24 months of Acceptance Test	80%
Within 25 – 36 months of Acceptance Test	60%
Within 37 – 48 months of Acceptance Test	40%
Within 49 – 60 months of Acceptance Test	20%
More than 60 months after Acceptance Test	0%

Supplier-furnished commercially available Master Control Computer hardware will be subject to the repair or replacement warranties provided by its manufacturers or 24 months, whichever is greater.

6.7.1.3 Right to Operate Unsatisfactory Equipment

If the operation or use of the materials or equipment after delivery and/or installation does not reasonably comply with the technical requirements set out in the contract, London Hydro shall have the right to operate and use such materials or equipment until such deficiency can be corrected provided that such operation or use pending correction shall not unreasonably impede or delay the ability of the successful bidder to perform corrections.

Such operation shall not constitute an acceptance of any part of the work, nor shall it relieve the supplier of any requirements of the contract, nor shall it act as a waiver by London Hydro of any requirement in the contract.

6.7.1.4 Long Term Availability of Spare Parts

Bidders shall certify the availability of spare parts for the networking communications equipment (interface cards in revenue meters, and components for regional collectors, and relays if any) for a period of at least sixteen (16) years from the date of final AMI system acceptance.

6.7.2 Service Maintenance and Support

Bidders shall describe maintenance support for AMI system infrastructure, not including electric meters, including problem notification and repair. Please include a description of the following:

- All parties with which London Hydro will be working to obtain support services;
- Response procedures for priority versus non-priority calls;
- Level of support and hours of service for each level of support;
- Response time for each level of support; and
- Remote-support capabilities, if available.

Bidders shall describe service contract options, and provide and illustrative quote for an annual maintenance contract beyond Phase I.

6.7.3 Meter Design for End-of-Life Disassembly and Materials Recycling

In anticipation of future regulations and directives mandating the recycling of electronic waste (or e-waste), preference will be given to revenue meters designed for simple end-of-life disassembly and material recycling. Such measures include, but are not limited to, the following:

- The resins used in the transparent cover and meter base components shall be embossed with the appropriate recycling symbol (pursuant to the Society of the Plastics Industry's resin identification coding system) to make resin reprocessing possible.
- The number of parts and materials used in a meter shall be minimized, making it simpler to sort and recycle.
- Parts that snap together are favoured over screws or other fasteners. If screws must be used, the same type of screws, all oriented in the same direction (so they can be removed in rapid succession, using one tool), is preferred.

Figure 6-22, Example Resin Identification Code

- Gluing product parts together should be avoided (because adhesives contaminate the recycled materials and make sorting next to impossible).

Bidders shall indicate the types of resins used for both the meter cover and meter base, and provide evidence (e.g. photograph) that each component is embossed with a recycling symbol.

Note: London Hydro presently separates scrap electro-mechanical meters into two bins: one with glass covers, and the other with the metallic registers, current coils, rotors, terminals, etc, for recycling by scrap dealers. Modern day plastic meters destined for landfill would degrade very slowly and represent a waste of a valuable, non-renewable petrochemical resource.

7. PROPOSAL

7.1 Submittal

Firms interested in submitting a proposal in response to this RFP should provide a Notice of Intent to Propose by the date noted on page 9 of the RFP via facsimile addressed to Tom Beacock, followed with originals by regular mail. The notice should contain the name, address, phone number and e-mail address of the bidder's designated contact person.

Ten (10) hard copies of the proposal (the Technical and Cost sections of the proposal shall be separated; the Cost proposal shall be submitted in a sealed envelope) are due no later than the time and date noted in Section 3, *Calendar of Events* (see page 9 herein). All proposals should be delivered in a sealed package or packages to:

London Hydro Inc.
111 Horton Street
London, Ontario
CANADA N6K 2T7

Attention: Tom Beacock, Purchasing Agent

Hard copies of the proposal shall be provided on 8 ½" x 11" paper. Electronic copies of the technical proposal are acceptable (as an alternative to hard copies of the technical proposal), if provided on a CD or memory stick in standard Microsoft Office format (.doc, xls, .dbf, .mpp), Adobe (.pdf) or AutoCad™ (.dwg, .dwf).

Proposals received after the Proposal Due Date will not be considered, nor will faxed or e-mailed proposals, whenever received. Failure to submit a proposal on time will not be waived by London Hydro under any circumstances (e.g., traffic conditions, mail or courier failure, etc.).

London Hydro may conduct interviews of those bidders found to be the most qualified to provide Advanced Metering Infrastructure (AMI). If interviews are conducted, the bidder selected for an interview will be notified in advance of the interview date(s).

7.2 Requirements

The proposal package shall include the following information and documents in the following order:

- Cover letter signed by the appropriate authorities
- Table of conformance to specifications
- Detailed technical proposal
- Cost proposal

- Supporting literature and documentation

Four of the elements are further described in the sub-sections that follow. The fifth element is self-evident.

7.2.1 Cover Letter

Bidders shall submit a letter on company letterhead signed by an official who is authorized by and binding on the bidder's organization. The authorized official shall certify that all information is true, accurate and complete, and shall further certify that the proposal will remain valid for 120 days from the date submitted, and that upon award of contract all prices shall be firm and valid for the duration of the contract.

If the bidder represents offerings to be made by different firms or organizations, London Hydro will do business only with the bidder and will require the bidder's organization to assume responsibility for the total project.

7.2.2 Table of Conformance

It is essential that bidders make very clear where exception is taken to any minimum specification in order to prevent disqualification of the proposal. Therefore, exceptions, conditions or qualifications to the provisions of London Hydro's minimum specifications shall be clearly identified as such, together with the reasons. If a bidder does not make it clear that an exception is taken, London Hydro will assume that the proposal is responding to and will meet the minimum specifications as written.

Two (2) tables of conformance shall be provided, as identified below:

- The first, showing conformity to the Ontario Ministry of Energy's Functional Specification, shall be approximately as depicted in Appendix D.1, *Table of Conformance for Base MoE Functional Specification;*
- The second, showing conformity to this RFP, shall be approximately as depicted in Appendix D.2, *Table of Conformance for London Hydro's RFP*.

7.2.3 Detailed Technical and Project Management Proposal

The checklists included as Appendix D.3, *Technical Information to be Included with Proposals*, and Appendix D.4, *Other Information to be Included with Proposal*, are intended to assist the bidder in preparing a thorough technical proposal. The reference list (see Appendix D.6) shall be included in both the technical and cost proposals.

Bidders should be aware that all technical and operational specifications, equipment descriptions, and marketing materials submitted or made available by the bidder in connection with this RFP are a part of the contract. London Hydro discourages the inclusion of general marketing materials unless they are used to provide specific information.

7.2.4 Cost Proposal

The cost proposal shall include the following elements:

- A pricing sheet, as depicted in Appendix D.5, *Price Proposal and Cost Elements*;
- A reference list, as depicted in Appendix D.6, *Reference List*; and
- Company profile information, as listed in Appendix D.7, *Bidder's Corporate Information*.

London Hydro is interested in receiving any unique or creative comments or proposals that would enable it to reduce overall Capital and /or ongoing O&M costs.

No bid shall include the Ontario Provincial Sales Tax (PST) nor the Canadian Goods and Services Tax (GST).

All bids shall be structured such that the successful bidder shall pay the shipping costs (and the insurance costs) from the point of manufacture to London Hydro's facilities, at which point London Hydro will take responsibility (i.e. FOB London Hydro).

7.3 Proposal Evaluation Criteria

All proposals received from vendors will be reviewed and evaluated by a committee of qualified personnel. This committee will recommend for selection the proposal that most closely meets the requirements of this RFP.

Note: The bid evaluation committee will have representation from Electric Metering, Meter Data Management, Information Services, and Purchasing.

7.3.1 Review Criteria

The award, if any, will be made to the best bidder(s). In evaluating whether a vendor is the best bidder, the review committee may utilize some or all of the following criteria in addition to any mentioned throughout this RFP:

- Information submitted in the proposal.
- Information obtained from the listed references.
- Technical merit.
- Experience, qualifications, and references of the firm.
- Proposal's responsiveness to the scope of work and minimum requirements.
- Proposed timeline.
- Demonstrated experience in the design, implementation and operation of Advanced Metering Infrastructure (AMI) networks.
- Competitive price.
- The quality of the product and services offered.
- The capacity of the vendor to perform the contract or provide the service promptly, within the time specified, and without delay or interference.

- The sufficiency of the vendor's financial resources.
- The character, integrity, reputation, judgment, training, experience and efficiency of the vendor.
- Vendor's use of open standards.

Bidders are advised that London Hydro's ability to evaluate proposals is dependent in part on the Bidder's ability and willingness to submit proposals which are well ordered, detailed, comprehensive, and readable. Clarity of language and adequate, accessible documentation is essential.

7.3.2 Basis of Award

The following criteria will be of major importance in making the selection.

Table 7-1, Proposal Evaluation Weightings

• System and equipment capabilities, including security and the proprietary or non-proprietary nature of the system	50 pts
• Experience / qualifications / references	10 pts
• Ability to provide local technical service / support	5 pts
• Corporate integrity, values, quality systems, etc.	5 pts
• Costs, including future costs	30 pts

London Hydro reserves the right to award in whole or in part, whatever is deemed to be in its best interest.

7.4 Selection Process

7.4.1 General

While London Hydro staff recognizes that there is no ideal AMI system and that some concession to features and functionality will need to be made, it is the intent of staff to evaluate the system features and financial impact of the proposals meeting minimum Ministry of Energy specifications and choose the AMI system that best meets the needs and goals of London Hydro.

7.4.2 Use of Fairness Commissioner

A Fairness Commissioner (PRP International) has been retained to act as a neutral, impartial and independent monitor of the entire RFP and AMI bid evaluation process.

7.4.3 Request for Additional Information

Prior to the final selection, bidder may be required to submit additional information which London Hydro may deem necessary to further evaluate bidder's qualifications or offering.

If London Hydro's evaluation committee considers a need, bidders shall be required to arrange demonstrations of items bid, preferably at London Hydro's facility or another facility within Ontario. Failure to be able to provide such working demonstration may disqualify the bidder's submission.

7.4.4 Proposals for Partial Solutions

London Hydro will not accept proposals with interim or partial solutions that do not address the architecture specified in this document in its entirety.

7.5 Instructions and Conditions

7.5.1 Limitations

This RFP does not commit London Hydro to award a contract, pay any costs incurred in the preparation of a proposal, or procure or contract for services of any kind whatsoever. London Hydro reserves the right, in its sole discretion, to accept or reject any or all responses to this RFP, to negotiate with any or all firms considered, or to cancel this RFP in whole or in part. London Hydro reserves the right to request additional information from any or all bidders.

Bidders may be requested to clarify the contents of their proposal. Other than to provide such information as may be required by London Hydro, no bidder will be allowed to alter its proposal or to add new information after the proposal due date.

A bidder may be required to participate in Statement of Work negotiations and to submit any price, technical or other revisions to its proposal which may result from such negotiations.

7.5.2 Proposal Submission

Non-responsive proposals include, but are not limited to, those that:

- Are irregular or not in conformance with the RFP requirements and instructions;
- Are conditional (i.e. the proposal has conditions attached which are not authorized by the RFP), incomplete (i.e. significant omissions of required information), indefinite or ambiguous;
- Are intended to accomplish only part of the overall work;
- Have no signature or an improper one; or
- Are not submitted on time or are submitted at any time via facsimile or e-mail.

London Hydro may waive minor informalities or irregularities in a proposal that are merely a matter of form and not substance and the correction of which would not be prejudicial to other proposals. Failure to submit a proposal on time will not be waived by London Hydro under any circumstances, e.g. traffic conditions, mail or courier failure, etc.

7.5.3 Disqualification of Bidder

A bidder's proposal may also be disqualified for any of the following reasons:

- Having defaulted on a previous contract, or performing poorly on a previous contract;
- Reason to believe collusion exists among the bidders; or
- Lack of competency, skill, judgment, financial capability, integrity, reputation, reliability or responsibility to perform the work as revealed by proposal questionnaires, financial statement, performance history or other relevant information obtained by London Hydro.

7.5.4 Addenda: Errors and Omissions

If a bidder discovers any ambiguity, conflict, discrepancy, omission or other error in this RFP, immediately notify Tom Beacock, in writing, of such error and request clarification or modification to the document.

Should London Hydro find it necessary, modification to the RFP will be made by written addenda to the RFP. Such modifications will be given to all parties who have been recorded by London Hydro as having been furnished an RFP.

If a bidder fails to notify London Hydro of a known error or an error that reasonably should have been known prior to the final filing date for submission, the bidder shall assume the risk. If awarded the contract, the bidder(s) shall not be entitled to additional compensation or time by reason of the error or its late correction.

7.5.5 Public Records

After award of contract, proposal responses shall be considered public record and subject to review. If a bidder believes a specific section of its proposal response is confidential, the bidder shall mark the page(s) confidential and isolate the pages marked confidential in a specific and clearly labeled section of its proposal response. The bidder shall include a written statement as to the basis for considering the marked pages confidential and London Hydro will review the material and make a determination.

Note: This requirement is to demonstrate compliance with clause 2(4) within Ontario Regulation 427/06 entitled: "*Smart Meters: Discretionary Metering Activity and Procurement Principles*"[19] should the need arise. Such a review would be carried out by the Ministry of Energy or Ontario Energy Board.

[19] This regulation is posted electronically on the provincial government's website at URL: http://www.e-laws.gov.on.ca/DBLaws/Source/Regs/English/2006/R06427_e.htm

7.5.6 Insurance

London Hydro does not require proof of insurance with the submittal of responses to this RFP. However, prior to award of contract, London Hydro will require proof of insurance from the successful bidder. The insurance requirements are outlined below:

- Comprehensive general liability insurance on an occurrence basis for an amount not less than two million dollars ($2,000,000) and shall include London Hydro as an additional insured with respect to the successful bidder's operations, acts and omissions relating to its obligations under the Agreement.
- Automobile liability insurance for an amount not less than two million dollars ($2,000,000) covering all vehicles used in any manner in connection with the performance of the terms of the Agreement.

London Hydro's standard insurance forms will be provided to the successful bidder.

The successful bidder will be allowed five (5) business days to provide insurance after they receive the Notice to Award letter. If London Hydro requires corrections, the bidder has five days from such request to complete all corrections. Failure to meet these deadlines will allow London Hydro the right to reject the proposal and proceed to the next finalist.

7.5.7 Period that Proposals Remain Valid

Each bidder agrees that proposals will remain firm for a period of one-hundred and twenty (120) calendar days after the date specified for receipt of proposals.

7.5.8 Contract Terms and Conditions

London Hydro's standard contract Terms and Conditions are provided in Appendix E. Bidders should assume full compliance to London Hydro's terms and conditions in submitting proposal. Submittal of a response will serve as agreement to all London Hydro's terms and conditions as attached.

However, bidders may request exceptions as part of their submittal. London Hydro will consider exceptions proposed by the bidder and may agree to such exceptions as part of contract negotiations. Exceptions requested by bidders should be substantially similar to London Hydro's terms and conditions.

7.5.9 Bid Securities

Bids shall be accompanied with a certified or cashier's cheque or bidder's bond in the amount of five-thousand dollars ($5,000.^{00}) and made payable to London Hydro Inc. Said cheque or bond shall be given as a guarantee that the bidder will, if selected, enter into final contract negotiations (as outlined in Section 7.5.14 herein).

If a bidder's proposal is not accepted by London Hydro within the validity period (as set forth in Section 7.5.7 herein) the contract, or if the successful bidder executes and delivers a contract, the certified cheques or bid bonds will be returned.

7.5.10 Milestone Payment Schedule

The proposed milestone payment schedule is based on the successful completion of the milestones outlined in Table 7-2 below. Bidders shall either state its acceptance of this schedule or provide an alternate milestone payment schedule in the proposal for London Hydro's evaluation.

Table 7-2, Proposed Milestone Payment Schedule

Milestone	Activity	Percentage of Total Contract
1	Project Initiation (contract execution)	5%
2	Phase I meters, regional collectors, and interconnecting communications channels installed and communicating to AMI master control computer	30%, payable in monthly payments over installation timeframe
3	Completion of staff training, supply of documentation (including warranties and licenses), supply of spare parts	5%
4	Completion of AMI Acceptance Testing	30%
5	Final System Acceptance (successful, continuous operation of the AMI system for six months after conclusion of AMI Acceptance Testing)	30%

Note: Due to the nature of this project, unless bidders wish to provide a 100% performance bond, London Hydro will only accept milestone payment schedules that are heavily weighted toward the end of the project when overall success is demonstrable.

The making of a progress payment to the successful bidder does not relieve the bidder of responsibility for faulty material or workmanship and London Hydro by such payment does not waive any claims of overpayment resulting from mathematical error, unauthorized work, or from any other cause.

7.5.11 Software Licenses

7.5.11.1 Software Elements

Bidders shall provide all software elements, licensing information, costs, and agreements for all developed and third party software, used in their proposal submission.

7.5.11.2 Future Software Upgrades Delivery

The information shall describe how the bidder will price, deliver and install future software upgrades for both bidder's and third-party software.

7.5.11.3 Non-titled Perpetual Software Licenses

London Hydro does not seek to obtain title to software, which is proposed. It is, however, the intention of this acquisition to obtain all necessary software licenses.

By submitting a proposal, bidders agree that upon award, London Hydro will automatically obtain a perpetual, non-transferable (except as specifically provided herein), and non-exclusive license to use all of the successful bidder's software which is acquired as the result of these specifications, including all documentation comprising the same. No further license fees or expenses shall be charged to London Hydro for current and/or future use of such software, documentation, etc., except for support and maintenance charges after any warranty period as herein provided.

7.5.11.4 Software Upgrade License and Documentation

The license granted through these specifications shall include, in addition to its description herein or in any documents furnished to London Hydro, any improvements, additions or modifications of the version or versions of the software which the bidder licenses to London Hydro, as well as all materials, documentation and technical information provided to London Hydro in written form and identified in any document furnished to London Hydro. London Hydro shall have the right, as part of the license obtained through these specifications, to make as many copies of the documentation for its own use as it may determine to be needed.

7.5.11.5 Title (Software)

If bidder intends that London Hydro acquire title to any software, document, etc., bidder must specifically so state in its proposal. In such case, upon passage of title to London Hydro, London Hydro shall own and possess all rights and interest in such software, documentation, etc.

Accordingly, the provisions herein relating to confidentiality or proprietary notice shall not be applicable to such software, documentation, etc.

7.5.12 Prime Contract Responsibility

If a bidder's proposal includes hardware, software, or services to be provided by other entities, it is mandatory for the successful bidder to be able to furnish all of the products and services proposed to meet the mandatory specifications. The successful bidder shall be the sole point of contact for any and all charges resulting from the purchase of the proposed hardware, software, and services for the initial procurement, as well as any additional items that are proposed to be supplied directly by the successful bidder.

The successful bidder shall take full responsibility for the demonstration, delivery, installation, and acceptance testing of the items proposed to be supplied directly by the bidder. The successful bidder shall also provide and specify maintenance and warranties for its products and pass through warranties of other entities. The bidder's

proposal shall clearly indicate the hardware, software or services which are note marketed or maintained by their firm.

7.5.13 Incorporation of RFP and Proposal in Contract

This RFP and the successful bidder's response, including all promises, warranties, commitments, and representations made in the successful proposal, shall be binding and incorporated by reference in London Hydro's contract with the successful bidder.

7.5.14 Final Contract Negotiations

Any conditions and provisions that a bidder seeks shall be a part of this proposal. Notwithstanding, nothing herein shall be interpreted to prohibit London Hydro from introducing or modifying contract terms and conditions during negotiation of the final contract.

London Hydro has scheduled no more than two weeks for contract negotiations (if necessary), and expects the successful bidder to maintain a prompt and responsive negotiation to accomplish and complete final contract agreement within that time period. If contract negotiations exceed an interval acceptable to London Hydro, London Hydro retains the option to terminate negotiations and continue to the next apparent successful bidder, at the sole discretion of London Hydro. Said interval shall in no event be less than three weeks.

7.5.15 News Release by Vendors

As a matter of policy, London Hydro does not endorse the products or services of a contractor. News releases concerning any resultant contract from this solicitation will not be made by a contractor without the prior written approval of London Hydro. All proposed news releases will be routed to London Hydro for review and approval.

7.6 Debriefing of Unsuccessful Bidders

Upon written request, a debriefing will be scheduled with unsuccessful bidders after London Hydro has provided notice of its selection of one or more successful bidder.

Discussion will be limited to a critique of the requesting bidder's proposal. Comparisons between proposals or evaluations of the other proposals will not be discussed. Debriefings may be conducted in person or on the telephone.

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Appendices

Appendix A
Purchasing Descriptions for Energy Meters

A.1 Single-Phase Self-Contained Energy Meters

A.2 Network-Style Self-Contained Energy Meters

A.3 Polyphase Self-Contained Energy Meters

A.1 Purchasing Specification for Single-Phase Self-Contained Energy Meters

London Hydro's purchasing specification for single-phase self-contained energy meters, as would typically be used for revenue metering of three-wire 120/240 V single-phase residential services, is replicated below:

Note: These specifications reflect what established meter manufacturers, that regularly quote on London Hydro's requirements, will have on-file. Those clauses that may not be applicable for Smartmeter procurements have been specifically annotated as such in the left column.

Item	Qty	Description	Per	Price
1	--	Single-phase, socket-style, energy meter; as per CSA Standard CAN3-C17-M84 (R2004), *Alternating-Current Electricity Metering*, for a self-contained, S-base, 4-terminal, watt-hour meter rated 60 Hz, 240 V, and 200 A (ANSI Form 2S); intended for revenue metering of a three-wire 120/240 V single-phase residential service.	ea	$ ____

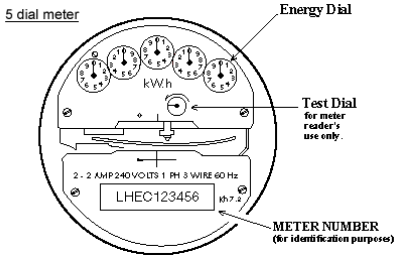

Figure 1, Face of Typical Residential Energy Meter

The revenue meter shall be approved for revenue metering by Measurement Canada. Suppliers shall include a reference to the *Notice of Approval* number in their quotation.

Clause Not Applicable for Smartmeter Procurements

For this procurement, the revenue meters shall be equipped with Itron ERT® (Encoder, Receiver, Transmitter) meter modules (for wireless communications with existing mobile meter reading units).

The purchaser's badge-plate shall identify the utility and include the so-called 6-digit local number, as well as a bar code version of the local number. The bar code shall conform to Uniform Code Council's *code 128 symbology*, as defined in ANSI/UCC Standard 4-1995, *UCC/EAN-128 Application Identifier Standard.*

The revenue meters shall be ordered by ascending manufacturer's serial number and individually labeled with the series of local numbers starting with XXXXXX and ending with XXXXXX (specified by London Hydro at time of order placement).

The meter shall be factory-configured for London Hydro's application, and then verified and sealed (to prevent unauthorized access to metrological adjustments) in accordance with the requirements set forth within the Canadian *Electricity and Gas Inspection Act*.

Note: For revenue meters within London Hydro's Scope of Accreditation, the supplier may provide optional pricing for non-sealed revenue meters. ea $ ____

Additional deliverables shall include:

- Inspection Certificates (for meters delivered sealed);
- Electronic and hardcopy records of the meter configuration parameters (for electronic meters); and
- A CD-ROM containing the configuration programming software for the revenue meters, and the technical support documentation (in PDF format) covering operation and maintenance of the meter (for electronic meters).

London Hydro's Electric Metering Department operates in accordance with a registered ISO-9001:2000 quality management system. As a contractual condition, the successful supplier agrees that all quality records pertaining to London Hydro's procurement of revenue meters shall be made available for inspection by London Hydro (including their representatives, and auditors or registrars for London Hydro's quality management system). The successful supplier shall make such records available for a minimum period of seven years from the date on the governing purchase order. A customer audit will be limited in access to only those records relating to the work performed for London Hydro.

Supplier's Guarantees:

- Delivery: _____ weeks A.R.O.

Note to Suppliers: The evaluation criteria are initial price, initial seal life (as stipulated by Measurement Canada in the Notice of Approval), delivery, and past performance of both the product and supplier (with respect to delivery and product support).

If the specified revenue meters are not delivered within the time period promised, and specified in London Hydro's purchase order, a late delivery penalty of one percent (1%) per calendar week shall apply. The amount of the penalty payment shall not exceed ten percent (10%) of the total quoted price and will be deducted from the Supplier's invoice.

Note: In the event that London Hydro determines that late delivery of the meters will not interfere with the utility's commitment to provide electric power, relief may be granted from the late delivery penalty via a formal contract change notice. However, the onus is on the Supplier to make formal advance application for such a contract change.

List May Not Be Applicable for Smartmeter Procurements

Suggested Products and Suppliers:

- Itron, Inc. .....Centron type C1S
- General Electric.....I-210 or I-70
- Elster.....Rex or AB1
- Landis & Gyr.....Focus or MX
- Sensus.....iCON type S01

London Hydro Stock Code: n/a

2	1	Optional in-house technical training for Metering Technicians.	ea	$____

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A.2 Purchasing Specification for Network-Style Self-Contained Energy Meters

London Hydro's purchasing specification for network-style self-contained energy meters, as would typically be used for revenue metering of three-wire 120/208Y V tenant suite services in an apartment building, is replicated below:

Note: These specifications reflect what established meter manufacturers, that regularly quote on London Hydro's requirements, will have on-file. Those clauses that may not be applicable for Smartmeter procurements have been specifically annotated as such in the left column.

Item	Qty	Description	Per	Price
1	--	Network, socket-style, energy meter; as per CSA Standard CAN3-C17-M84 (R2004), *Alternating-Current Electricity Metering*, for a 2-element, self-contained, S-base, 5-terminal, watt-hour meter rated 60 Hz, 120 V, and 200 A (ANSI Form 12S); intended for revenue metering of a three-wire 120/208Y V network service to a tenant suite in an apartment building.	ea	$ ____

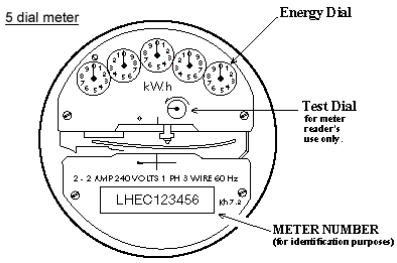

Figure 1, Face of Typical Network-Style Energy Meter

The revenue meter shall be approved for revenue metering by Measurement Canada. Suppliers shall include a reference to the *Notice of Approval* number in their quotation.

The purchaser's badge-plate shall identify the utility and include the so-called 6-digit local number, as well as a bar code version of the local number. The bar code shall conform to Uniform Code Council's *code 128 symbology*, as defined in ANSI/UCC Standard 4-1995, *UCC/EAN-128 Application Identifier Standard.*

The revenue meters shall be ordered by ascending manufacturer's serial number and individually labeled with the series of local numbers starting with XXXXXX and ending with XXXXXX (specified by London Hydro at time of order placement).

The meter shall be factory-configured for London Hydro's application, and then verified and sealed (to prevent unauthorized access to metrological adjustments) in accordance with the requirements set forth within the Canadian *Electricity and Gas Inspection Act*.

Note: For revenue meters within London Hydro's Scope of Accreditation, the supplier may provide optional pricing for non-sealed revenue meters. ea $ ____

Additional deliverables shall include:

- Inspection Certificates (for meters delivered sealed);

- Electronic and hardcopy records of the meter configuration parameters (for electronic meters); and
- A CD-ROM containing the configuration programming software for the revenue meters, and the technical support documentation (in PDF format) covering operation and maintenance of the meter (for electronic meters).

London Hydro's Electric Metering Department operates in accordance with a registered ISO-9001:2000 quality management system. As a contractual condition, the successful supplier agrees that all quality records pertaining to London Hydro's procurement of revenue meters shall be made available for inspection by London Hydro (including their representatives, and auditors or registrars for London Hydro's quality management system). The successful supplier shall make such records available for a minimum period of seven years from the date on the governing purchase order. A customer audit will be limited in access to only those records relating to the work performed for London Hydro.

Supplier's Guarantees:

- Delivery: _____ weeks A.R.O.

Note to Suppliers: The evaluation criteria are initial price, initial seal life (as stipulated by Measurement Canada in the Notice of Approval), delivery, and past performance of both the product and supplier (with respect to delivery and product support).

If the specified revenue meters are not delivered within the time period promised, and specified in London Hydro's purchase order, a late delivery penalty of one percent (1%) per calendar week shall apply. The amount of the penalty payment shall not exceed ten percent (10%) of the total quoted price and will be deducted from the Supplier's invoice.

Note: In the event that London Hydro determines that late delivery of the meters will not interfere with the utility's commitment to provide electric power, relief may be granted from the late delivery penalty via a formal contract change notice. However, the onus is on the Supplier to make formal advance application for such a contract change.

List May Not Be Applicable for Smartmeter Procurements

Suggested Products and Suppliers:

- Itron, Inc. .....Centron type CN1S
- General Electric.....V62S
- Elster.....ABS-5 or Rex
- Landis & Gyr.....Focus
- Sensus.....iCON

London Hydro Stock Code: n/a

2 1 Optional in-house technical training for Metering Technicians. ea $____

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A.3 Purchasing Specification for Polyphase Self-Contained Energy Meters

London Hydro's purchasing specification for three-phase self-contained energy meters, as would typically be used for revenue metering of 120/208Y V or 347/600Y V three-phase four-wire commercial services, is replicated below:

Note: These specifications reflect what established meter manufacturers, that regularly quote on London Hydro's requirements, will have on-file. Those clauses that may not be applicable for Smartmeter procurements have been specifically annotated as such in the left column.

Item	Qty	Description	Per	Price
1	--	Three-phase, socket-style, energy meter; as per CSA Standard CAN3-C17-M84 (R2004), *Alternating-Current Electricity Metering*, for a 3-element, self-contained, S-base, 7-terminal, watt-hour meter rated 60 Hz, auto-ranging voltage input of 120/208Y V to 347/600Y V, and 200 A; intended for revenue metering of a three-phase four-wire 120/208Y V or 347/600Y small commercial service.	ea	$ ____

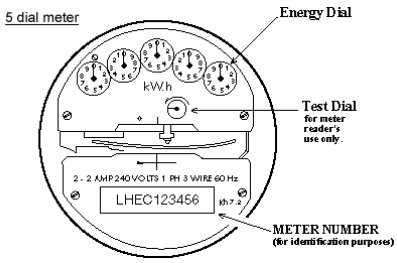

Figure 1, Face of Typical Polyphase Energy Meter

The revenue meter shall be approved for revenue metering by Measurement Canada. Suppliers shall include a reference to the *Notice of Approval* number in their quotation.

The purchaser's badgeplate shall identify the utility and include the so-called 6-digit local number, as well as a bar code version of the local number. The bar code shall conform to Uniform Code Council's *code 128 symbology*, as defined in ANSI/UCC Standard 4-1995, *UCC/EAN-128 Application Identifier Standard.*

The revenue meters shall be ordered by ascending manufacturer's serial number and individually labeled with the series of local numbers starting with XXXXXX and ending with XXXXXX (specified by London Hydro at time of order placement).

The meter shall be factory-configured for London Hydro's application, and then verified and sealed (to prevent unauthorized access to metrological adjustments) in accordance with the requirements set forth within the Canadian *Electricity and Gas Inspection Act*.

		Note: For revenue meters within London Hydro's Scope of Accreditation, the supplier may provide optional pricing for non-sealed revenue meters.	ea	$ ____

Additional deliverables shall include:

- Inspection Certificates (for meters delivered sealed);

- Electronic and hardcopy records of the meter configuration parameters (for electronic meters); and
- A CD-ROM containing the configuration programming software for the revenue meters, and the technical support documentation (in PDF format) covering operation and maintenance of the meter (for electronic meters).

London Hydro's Electric Metering Department operates in accordance with a registered ISO-9001:2000 quality management system. As a contractual condition, the successful supplier agrees that all quality records pertaining to London Hydro's procurement of revenue meters shall be made available for inspection by London Hydro (including their representatives, and auditors or registrars for London Hydro's quality management system). The successful supplier shall make such records available for a minimum period of seven years from the date on the governing purchase order. A customer audit will be limited in access to only those records relating to the work performed for London Hydro.

Supplier's Guarantees:

- Delivery: _____ weeks A.R.O.

Note to Suppliers: The evaluation criteria are initial price, initial seal life (as stipulated by Measurement Canada in the Notice of Approval), delivery, and past performance of both the product and supplier (with respect to delivery and product support).

If the specified revenue meters are not delivered within the time period promised, and specified in London Hydro's purchase order, a late delivery penalty of one percent (1%) per calendar week shall apply. The amount of the penalty payment shall not exceed ten percent (10%) of the total quoted price and will be deducted from the Supplier's invoice.

Note: In the event that London Hydro determines that late delivery of the meters will not interfere with the utility's commitment to provide electric power, relief may be granted from the late delivery penalty via a formal contract change notice. However, the onus is on the Supplier to make formal advance application for such a contract change.

List May Not Be Applicable for Smartmeter Procurements

Suggested Products and Suppliers:

- Itron, Inc. .....Centron type CP1S Sentinel
- General Electric.....kV2c
- Elster.....Alpha Plus or A3
- Landis & Gyr.....S4 or Altimus
-

London Hydro Stock Code: n/a

2	1	Optional in-house technical training for Metering Technicians.	ea	$____

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Appendix B

Ontario Ministry of Energy's AMI Specification

B.1 Functional Specification for an Advanced Metering Infrastructure

B.2 Letter of Intent (dated July 25, 2007) from Minister of Energy

FUNCTIONAL SPECIFICATION

FOR AN

ADVANCED METERING INFRASTRUCTURE

VERSION 2

July 14, 2007

FUNCTIONAL SPECIFICATION

FOR AN ADVANCED METERING INFRASTRUCTURE

Table of Contents

FUNCTIONAL SPECIFICATION

FOR AN ADVANCED METERING INFRASTRUCTURE

1.0 APPLICATION OF SPECIFICATION

This Specification sets the required minimum level of functionality for AMI in the Province of Ontario for residential and small general service consumers where the metering of demand is not required. This Specification is not intended to apply to net metering applications.

2.0 FUNCTIONAL SPECIFICATION

2.1 Deployment

This Specification shall be met regardless of the size or scope of the AMI deployment by a distributor.

2.2 Minimum Functionality

2.2.1 As a minimum:

2.2.1.1 AMI shall collect Meter Reads on an hourly basis from all AMCDs deployed by a distributor and transmit these same Meter Reads to the AMCC and MDM/R, as required, in accordance with these Specifications; and

2.2.1.2 A Meter Read shall be collected, dated and time stamped at the end of each hour (i.e. midnight as represented by 24:00).

2.2.2 The date and time stamping of Meter Reads shall be recorded as year, month, day, hour, minute (i.e. YYYY-MM-DD hh:mm).

2.2.3 All meters shall have a meter multiplier of one (1).

2.2.4 Distributors shall provide the MDM/R with the service multiplier for transformer-type meters.

2.3 Performance Requirements

2.3.1 Collection and Transmission of Meter Reads:

2.3.1.1 AMI shall successfully collect and transmit to the AMCC and MDM/R at least 98.0% of the Meter Reads from all AMCDs deployed by a distributor in any Daily Read Period.

2.3.1.2 Meter Reads unsuccessfully collected or transmitted shall not be due to the same AMI component (including, without limitation, any AMCD) during any three (3) month consecutive time period.

2.3.1.3 AMI shall be able to collect and transmit Meter Reads during its operating life without requiring a field visit.

2.3.2 Transmission Accuracy: Over the Daily Read Period, 99.9% of the Meter Reads received by the AMCC shall contain the same information as that collected by all AMCDs deployed by the distributor.

2.3.3 AMI shall be capable of providing Meter Reads with a precision of at least 10 Watt-hours (0.01 kWh).

2.4 Technical Requirements

2.4.1 When an AMI includes AMRCs, the AMRCs shall have the ability to store meter data to accommodate the performance requirements in section 2.3.1.

2.4.2 Time Synchronization:

2.4.2.1 AMI shall be operated and synchronized to Official Time, as set by the National Research Council of Canada.

2.4.2.2 AMI shall have the capability of adjusting for changes due to local daylight savings time.

2.4.2.3 AMI installed within a distributor's service area shall have the capability of accommodating more than one (1) time zone.

2.4.2.4 Time synchronization shall be maintained in the AMI to the specified accuracy parameters set out in section 2.4.3.1 following a loss of power.

2.4.2.5 All Meter Reads shall adhere to accurate time synchronization processes to ensure an accurate accounting of electricity consumption at each meter.

2.4.3 Time Accuracy:

2.4.3.1 At all times, time accuracy in the AMI shall not exceed a ±1.5 minute variance from the time established in section 2.4.2.1.

2.4.3.2 AMI shall be able to prove that time accuracy does not exceed the permitted time variance identified in section 2.4.3.1.

2.4.4 Loss and Restoration of Power:

2.4.4.1 AMI shall detect and identify the interval in which a loss of power occurred during a Daily Read Period.

2.4.4.2 AMI shall detect and identify the interval in which power was restored following a loss of power.

2.4.5 Environmental Tolerances: All AMI components (except the AMCC) shall operate and meet the requirements in these Specifications within a temperature range of minus thirty degrees Celsius (–30° C) to positive sixty-five degrees Celsius (+65° C), and within a humidity range of zero percent (0%) to ninety-five percent (95%) non-condensing.

2.5 Advanced Metering Communication Device (AMCD)

2.5.1 Installation Within the Meter:

2.5.1.1 The AMCD shall not impair the ability of the meter to be visually read.

2.5.1.2 Meters in which an AMCD is installed shall be able to be installed in existing meter sockets or enclosures.

2.5.1.3 AMCD shall meet or exceed ANSI standards to withstand electrical surges and transients.

2.5.2 Labeling:

2.5.2.1 The AMCD shall be permanently labeled with:

(1) Legally required labeling;

(2) Manufacturer’s name;

(3) Model number;

(4) AMCD identification number;

(5) Input/output connections;

(6) Date of manufacture; and

(7) Bar code for tracking and inventory management.

2.5.3 When installed at a consumer’s location, the meter shall visibly display, as a minimum, the AMCD identification number, meter serial number and LDC badge number for the meter.

2.5.4 The AMCD shall be able to be initialized or programmed during, or prior to, field installation.

2.6 Transmission of Meter Reads

2.6.1 All Meter Reads collected during the Daily Read Period shall be received by the AMCC and transferred to the MDM/R no later than 5:00 a.m. local time following the Daily Read Period.

2.6.2 Meter Reads are not required to be transmitted in a single transmission and may be transmitted as frequently as necessary in order to meet the requirements in section 2.6.1.

2.6.3 AMCC shall transfer the information identified in section 2.6.1 using an approved protocol and file structure.

2.7 Advanced Metering Regional Collectors (AMRC)

2.7.1 LAN Communication Infrastructure:

2.7.1.1 The spectrum allocation and wattage of the radio signal used by an AMI shall not impede neighbouring frequencies.

2.7.2 When an AMI includes AMRCs:

2.7.2.1 The AMI shall provide for the continuous powering of AMRCs regardless of their location and placement.

2.7.2.2 All AMCDs shall be able to collect and transmit Meter Reads when one or more AMRC has a loss of power.

2.7.2.3 Memory and software parameters shall be maintained at all AMRC during a loss of power, whether by the provision of backup/alternate power or other solution.

2.8 Advanced Metering Control Computer (AMCC)

2.8.1 Each AMCC shall have the ability to store a rolling sixty (60) days of Meter Reads.

2.8.2 A distributor shall not aggregate Meter Reads into rate periods or calculate consumption data from the Meter Reads collected through its AMI either in its AMCC or any other component.

2.8.3 The AMCC shall be able to perform basic operational verification of Meter Reads received before transmitting these Meter Reads to the MDM/R.

2.9 Customer Account Information

2.9.1 Distributors shall provide initial information associated with customer accounts to the MDM/R on a date to be determined.

2.9.2 On an ongoing basis, distributors shall provide information associated with any change to the initial information identified in section 2.9.1 to the MDM/R at a frequency to be determined.

2.9.3 Information to be provided to the MDM/R pursuant to sections 2.9.1 and 2.9.2 is to be determined.

2.10 Monitoring & Reporting Capability

2.10.1 The AMI shall have non-critical reporting functionality and critical reporting functionality as required in this section 2.10. Information generated from this reporting functionality shall be available to the MDM/R.

2.10.2 Non-critical reporting:

2.10.2.1 At the completion of every Daily Read Period and following a transmission of Meter Reads, the AMCC shall generate a status report that includes information regarding anomalies and issues affecting the integrity of the AMI or any component of the AMI including information related to any foreseeable impact that such anomalies or issues might have on the AMI's ability to collect and transmit Meter Reads.

2.10.2.2 In addition to section 2.10.2.1, the AMCC shall generate reports:

(1) Confirming successful initialization of the AMCD's installed in the field;

(2) Confirming data linkages among an AMCD identification number, LDC badge number, serial number and customer account;

(3) Confirming that the MDM/R has successfully received notification of any changes to customer account information;

(4) Confirming that the AMCC has successfully made changes to customer account information following receipt of same from the MDM/R;

(5) Confirming the successful collection and transmission of Meter Reads or logging all unsuccessful attempts to collect and transmit Meter Reads, identifying the cause, and indicating the status of the unsuccessful attempt(s) pursuant to section 2.3.1;

(6) Confirming the accuracy of the Meter Reads received by the AMCC pursuant to section 2.3.2;

(7) Confirming that all Meter Reads have a precision of at least 10 Watt-hours (0.01 kWh) pursuant to section 2.3.3;

(8) Confirming whether the Meter Reads acquired within the Daily Read Period are in compliance with the time accuracy levels identified in section 2.4.3;

(9) Confirming whether time synchronization within the AMI or any components of the AMI have been reset within the Daily Read Period;

(10) Identifying the intervals in which a loss of power occurred and at which power was restored, following a loss of power;

(11) Addressing the functionality of the AMCD communication link, including status indicators related to the AMCD and AMRC;

(12) Identifying suspected instances of tampering, interference and theft;

(13) Flagging potential network, meter, and AMCD issues; and

(14) Identifying any other instances that impact or could potentially impact the AMI's ability to collect and transmit Meter Reads to the AMCC and/or MDM/R on a daily basis.

2.10.2.3 Following a transmission of Meter Reads or at the completion of every Daily Read Period, the information in section 2.10.2.2 (5) shall be stored and used by the AMCC to assess compliance with the requirement specified in section 2.3.1.2.

2.10.2.4 The reports generated in sections 2.10.2.1 and 2.10.2.2 shall be made available to the MDM/R with a frequency to be determined.

2.10.3 Critical reporting:

Critical events are defined to include any AMI operational issue that could adversely impact the collection and transmission of Meter Reads during any Daily Read Period.

2.10.3.1 The AMI shall identify and report the following to the distributor:

(1) AMCD failures;

(2) AMRC failures;

(3) Issues related to the storage capacity of any component of the AMI;

(4) Communication links failures;

(5) Network failures; and

(6) Loss of power and restoration of power.

2.10.3.2 The reports generated in section 2.10.3.1 shall be made available to the MDM/R.

2.11 Security and Authentication:

2.11.1 The AMI shall have security features to prevent unauthorized access to the AMI and meter data and to ensure authentication to all AMI elements.

2.12 Proven Technology

2.12.1 The AMI shall be a technology that has been proven to reliably comply with these Specifications.

2.13 Regulatory Requirements

2.13.1 The AMI shall meet all applicable federal, provincial, and municipal laws, codes, rules, directions, guidelines, regulations and statutes (including any requirements of any applicable regulatory authority, agency, board, or department including Industry Canada, the Canadian Standards Association, the Ontario Energy Board and the Electrical Safety Authority) (collectively, "Laws"). For greater certainty, the AMI shall meet all applicable Laws that are necessary for the measurement of data and/or the transmission of data to and from the consumers within the Province of Ontario, including Laws applicable to metering, safety and telecommunications.

2.14 Water or Natural Gas Meter Reads

2.14.1 The AMI should be capable of supporting an increased number of Meter Reads associated with the reading and transmission of water and/or natural gas meters through additional ports on the AMCD, through optionally available multi-port AMCDs, or through additional AMCD/AMRC devices that are compatible with operating on the AMI. When procuring AMI, distributors shall obtain an indication of the capabilities of the proposed AMI to read water and natural gas meters, indicating the makes and models of such meters that can be read, and any requirements for retrofitting them.

3.0 DEFINITIONS

Within this Specification the following words and phrases have the following meanings:

"**AMCC**" is an advanced metering control computer that is used to retrieve or receive and temporarily store Meter Reads before or as they are being transmitted to the MDM/R. The information stored in the AMCC is available to log maintenance and transmission faults and issue reports on the overall health of the AMI to the distributor.

"**AMCD**" is an advanced metering communication device that is housed either under the meter's glass or outside the meter. It transmits Meter Reads from the meter directly or indirectly to the AMCC.

"**AMI**" means an advanced metering infrastructure. It includes the meter, AMCD, LAN, AMRC, AMCC, WAN and related hardware, software and connectivity required for a fully functioning system that complies with this Specification. With some technologies, an AMI does not include AMRCs. An AMI does not include the MDM/R.

"**AMRC**" is an advanced metering regional collector that collects Meter Reads over the LAN from the AMCD and transmits these Meter Reads to the AMCC.

"**consumer**" or "**customer**" means a person who uses, for the person's own consumption, electricity that the person did not generate.

"**distributor**" has the meaning provided in the *Ontario Energy Board Act, 1998*.

"**Daily Read Period**" means the 24-hour period for collecting Meter Reads, subject to the two periods annually during which changes to and from daylight savings time take place. The Daily Read Period ends at 12:00 midnight of each day.

"**LAN**" means a local area network, the communication network that transmits Meter Reads from the AMCD to the AMRC.

"**meter multiplier**" is the factor by which the register reading must be multiplied to obtain the registration in the stated units.

"**Meter Read**" is a number generated by a meter that reflects cumulative electricity consumption at a specific point in time.

"**MDM/R**" means the meter data management and meter data repository functions within which Meter Reads are processed to produce rate-ready data and are stored for future use.

"**Specification**" means these functional specifications.

"**transformer-type meter**" means a meter designed to be used with instrument transformers.

"**WAN**" means a wide area network, the communication network that transmits Meter Reads from the AMRC to the AMCC or, in some systems from the AMCD directly to the AMCC, and from the AMCC to the MDM/R.

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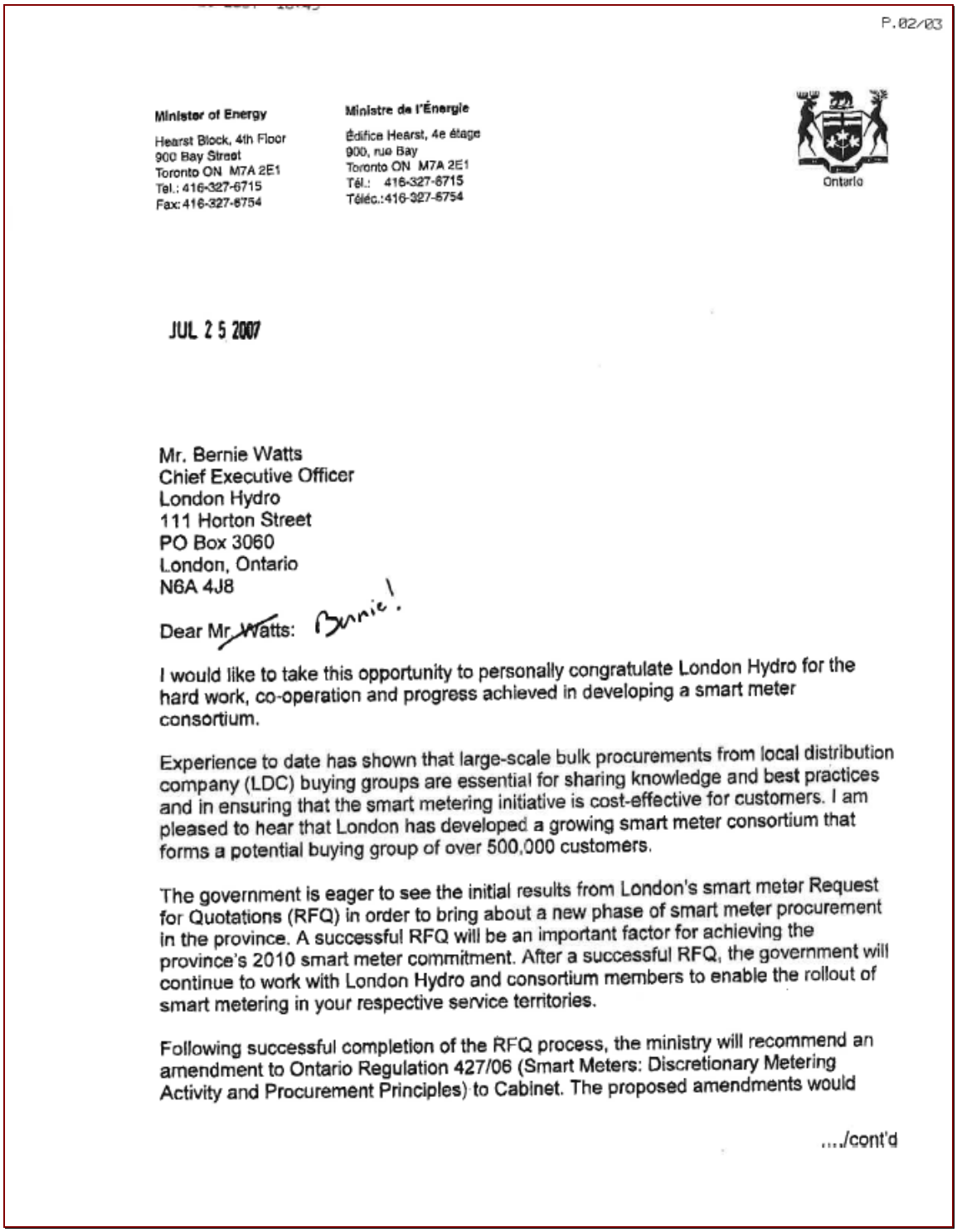
B.2 Letter of Intent (dated July 25th, 2007) from Minister of Energy

The following letter, received from the Minister of Energy, recognizes the efforts of the Smartmeter consortium and commits to "naming" the consortium in Ontario Regulation 427/06.



P.02/03

Minister of Energy
Hearst Block, 4th Floor
900 Bay Street
Toronto ON M7A 2E1
Tel.: 416-327-6715
Fax: 416-327-6754

Ministre de l'Énergie
Édifice Hearst, 4e étage
900, rue Bay
Toronto ON M7A 2E1
Tél.: 416-327-6715
Téléc.: 416-327-6754

Ontario

JUL 2 5 2007

Mr. Bernie Watts
Chief Executive Officer
London Hydro
111 Horton Street
PO Box 3060
London, Ontario
N6A 4J8

Dear Mr. ~~Watts~~ Bernie:

I would like to take this opportunity to personally congratulate London Hydro for the hard work, co-operation and progress achieved in developing a smart meter consortium.

Experience to date has shown that large-scale bulk procurements from local distribution company (LDC) buying groups are essential for sharing knowledge and best practices and in ensuring that the smart metering initiative is cost-effective for customers. I am pleased to hear that London has developed a growing smart meter consortium that forms a potential buying group of over 500,000 customers.

The government is eager to see the initial results from London's smart meter Request for Quotations (RFQ) in order to bring about a new phase of smart meter procurement in the province. A successful RFQ will be an important factor for achieving the province's 2010 smart meter commitment. After a successful RFQ, the government will continue to work with London Hydro and consortium members to enable the rollout of smart metering in your respective service territories.

Following successful completion of the RFQ process, the ministry will recommend an amendment to Ontario Regulation 427/06 (Smart Meters: Discretionary Metering Activity and Procurement Principles) to Cabinet. The proposed amendments would

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B.2 Letter of Intent (dated July 25th, 2007) from Minister of Energy (continued)

P.03/03

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authorize distributors participating in the London RFQ process to engage in discretionary metering activities.

As you know, the ministry cannot bind Cabinet's decision making. As such, nothing in this letter shall be construed as obligating the Cabinet or the legislature of the Province of Ontario to approve or promulgate the proposed amending regulation.

Thank you again for your continued support and co-operation with the smart metering initiative. We look forward to working with London Hydro in future to ensure that smart metering is a success in Ontario.

Sincerely,

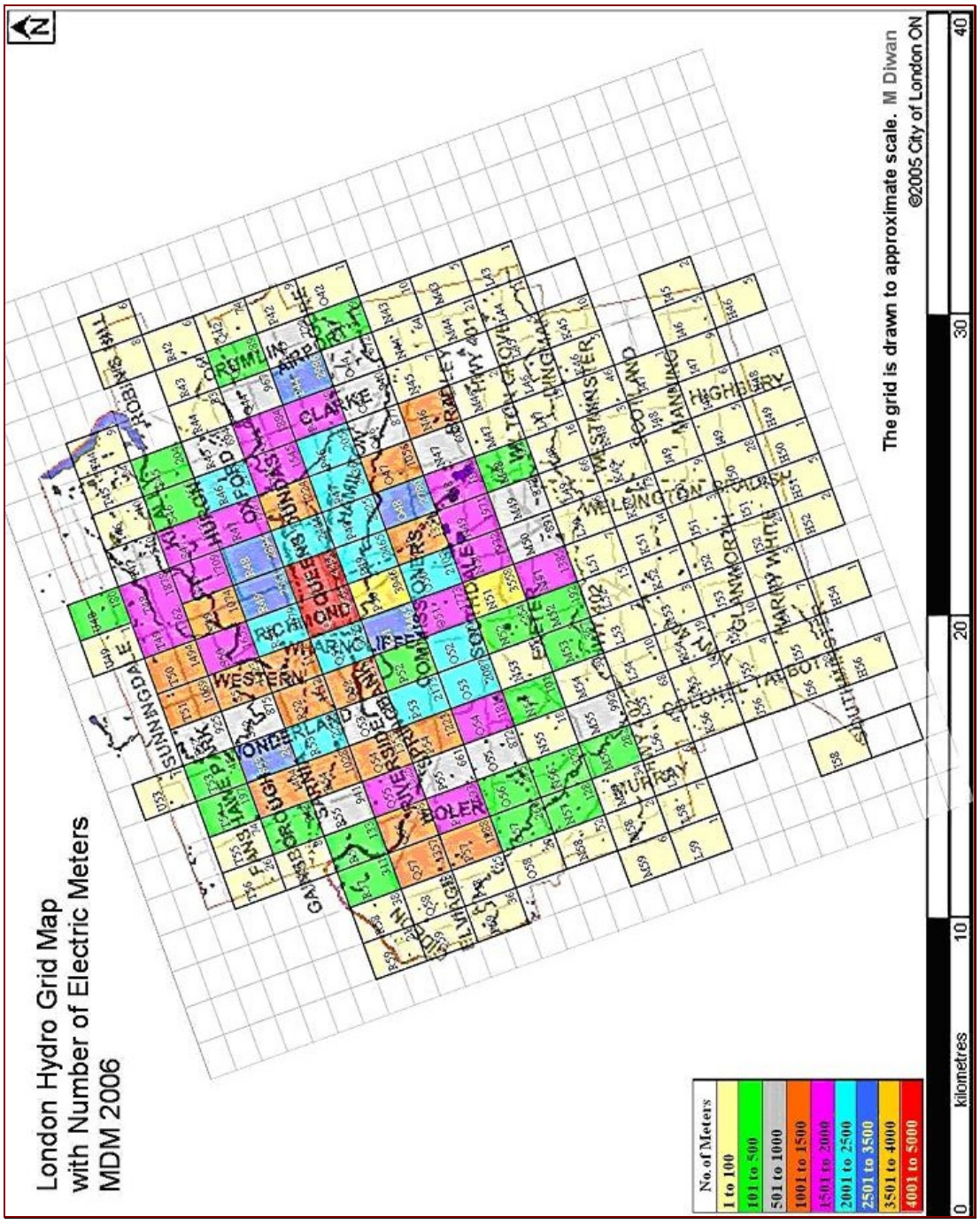
Dwight Duncan
Minister

Appendix C
Maps & Drawings

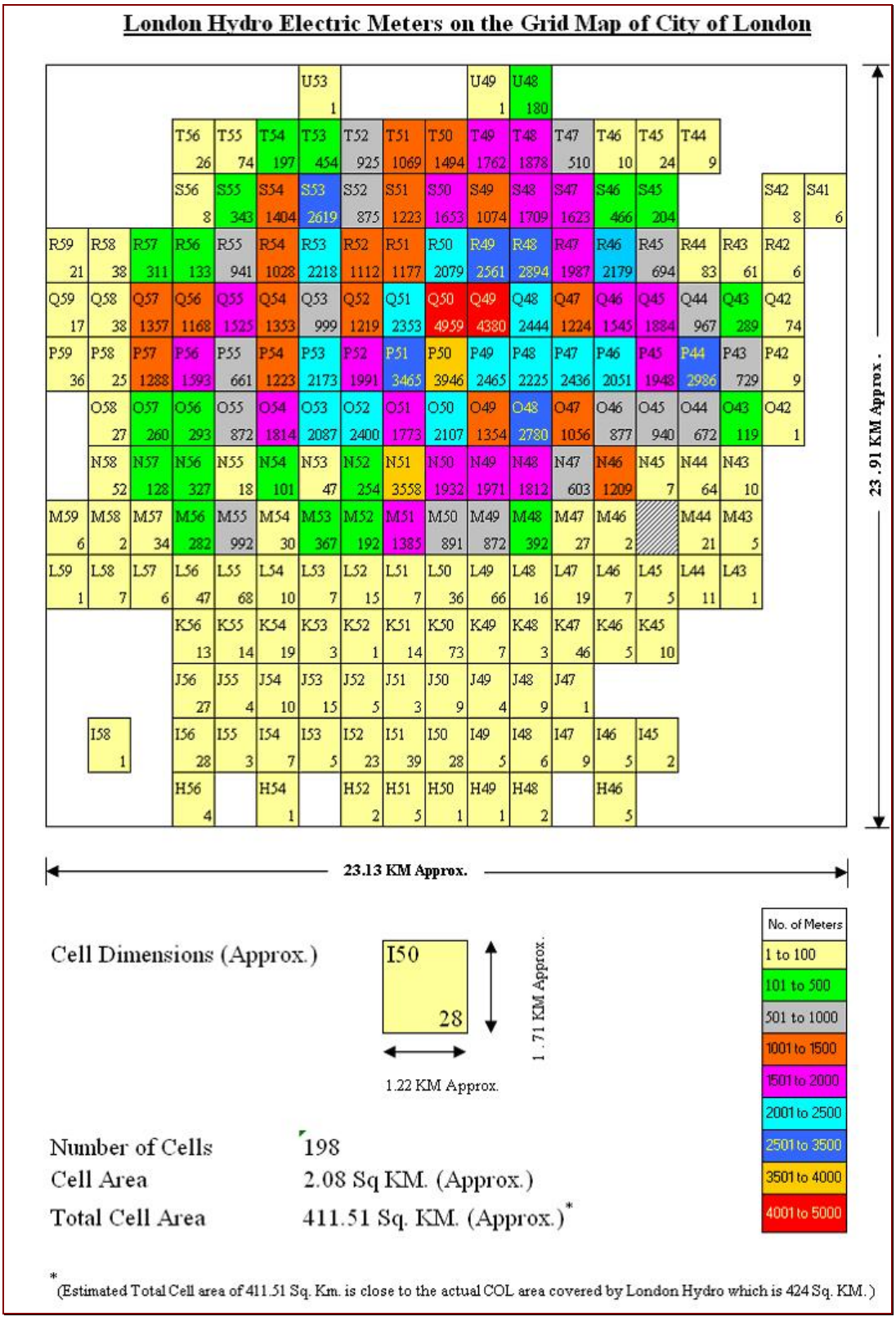
C.1 Revenue Meter Density Map Overlaid on City of London Map

C.2 Alternative Representation of Revenue Meter Density Map

C.1 Revenue Meter Density Map Overlaid on City of London Map



C.2 Alternative Representation of Revenue Meter Density Map



Appendix D
Form of Tender

D.1 Table of Conformance for Base Ministry of Energy Functional Specification

D.2 Table of Conformance for London Hydro's RFP

D.3 Technical Information to be Included with Proposals

D.4 Other Technical Descriptions to be Included with Proposal

D.5 Price Proposal and Cost Elements

D.6 Reference List

D.7 Bidder's Corporate Information

D.8 Bidder's Consent to Limited Dissemination of Proposal

D.1 Table of Conformance for Base MoE Functional Specification

With reference to the Ontario Ministry of Energy's baseline requirements, as defined within the document entitled *Functional Specification For An Advanced Metering Infrastructure* (included as Appendix B herein for convenience of reference), bidders shall fill in the following Table of Conformance using the following convention:

Entry	Meaning
C	Bidder fully complies with stated requirements
NC	Bidder partially complies or does not comply with stated requirements
Noted	No requirements stated, section heading or informational clause only

Where the bidder's product only partially complies, the bidder may include supplementary explanations and descriptions of their product offering.

Section	Section Title	Bidder's Statement
1.0	**APPLICATION OF SPECIFICATION**	**Noted**
2.0	**FUNCTIONAL SPECIFICATIONS FOR AN ADVANCED METERING INFRASTRUCTURE**	**Noted**
2.1	Deployment	
2.2	Minimum Functionality	
2.3	Performance Requirements	
2.4	Technical Requirements	
2.5	Advanced Metering Communications Device (ACMD)	
2.6	Transmission of Meter Reads	
2.7	Advanced Metering Regional Collectors (AMRC)	
2.8	Advanced Metering Control Computer (AMCC)	
2.9	Customer Account Information	
2.10	Monitoring & Reporting Capability	
2.11	Security and Authentication	
2.12	Proven Technology	
2.13	Regulatory Requirements	
2.14	Water or Natural Gas Meter Reads	
3.0	**DEFINITIONS**	**Noted**

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D.2 Table of Conformance for London Hydro's RFP

All bidders shall fill in the following Table of Conformance (to London Hydro's RFP) using the following convention:

Entry	Meaning
C	Bidder fully complies with stated requirements
NC	Bidder partially complies or does not comply with stated requirements
A	Bidder offers an alternative approach to fulfilling the underlying intent
N/A	Requirements not applicable to technology offered
--	No requirements stated; section heading only.
Noted	No requirements stated; informational clause only

Where the bidder is offering an alternative approach to the underlying intent or the bidder's product only partially complies, the bidder shall include supplementary explanations and descriptions of their product offering so that London Hydro may properly gauge the degree of compliance or the suitability of the alternative.

RFP Section	RFP Section Title	Bidder's Compliance	Reference(s) in Documentation
1.0	**PURPOSE OF THIS REQUEST FOR QUOTATION**	**Noted**	--
2.0	**INTRODUCTION**	**Noted**	--
3.0	**CALENDAR OF EVENTS**	**Noted**	--
4.0	**Contact Information**	**Noted**	--
5.0	**Project Overview**	**Noted**	--
6.0	**AMI System Requirements**	--	--
6.1	Overview of Application Environment	Noted	--
6.2	Technical Requirements of AMI	Noted	--
6.2.1	General Organization of Requirements	Noted	--
6.2.2	Purchasing Descriptions for Energy Meters (Level 1)		
6.2.3	MoE Technical Requirements for Advanced Metering Infrastructure (Level 2)		
6.2.4	Supplementary AMCD Requirements (Level 3)	--	--
6.2.4.1	Antenna & Transceiver Design Objectives for Wireless LAN Offerings		
6.2.4.2	Transceiver Design Objectives for Power Line Carrier (PLC) LAN Offerings		

RFP Section	RFP Section Title	Bidder's Compliance	Reference(s) in Documentation
6.2.4.3	Low Temperature AMCD Operation		
6.2.4.4	Product RF Certification		
6.2.5	Supplementary LAN Requirements (Level 3)	--	--
6.2.5.1	LAN Offerings Based on Wireless Mesh RF Technology		
6.2.5.2	LAN Offerings Based on PLC or BPL Technology		
6.2.6	Supplementary Inter-Device Communications Requirements (Level 3)	--	--
6.2.6.1	General		
6.2.6.2	Communications Network Interface		
6.2.6.3	Data Formats and Structures		
6.2.6.4	Electronic Security		
6.2.7	Supplementary Regional Collector Requirements (Level 3)	--	--
6.2.7.1	General		
6.2.7.2	Transceiver Design Objectives		
6.2.7.3	Loss of Supply Response		
6.2.7.4	Low Temperature Regional Collector Operation		
6.2.7.5	Product Certification		
6.2.7.6	WAN Migration Features		
6.2.8	Supplementary Master Control Computer Requirements (Level 3)		
6.2.8.1	Preferred Hardware and Operating System Platform		
6.2.8.2	Fault Tolerant Redundant Configuration		
6.2.8.3	User Interface Design Requirements		
6.2.8.4	Integration with Centralized Meter Data Management / Repository		
6.2.8.5	Integration with London Hydro's Corporate Computer Systems		
6.2.9	Mandatory Value-Added Functionality (Level 4A)		
6.2.9.1	General		
6.2.9.2	Outage Management System Interface		

RFP Section	RFP Section Title	Bidder's Compliance	Reference(s) in Documentation
6.2.9.3	Quality of Supply Voltage Reporting		
6.2.9.4	Bi-directional Revenue Meters		
6.2.9.5	Meter Phase Registration Failure Detection		
6.2.10	Discretionary Value-Added Functionality (Level 4B)		
6.2.10.1	General		
6.2.10.2	Remote Disconnect of Service		
6.2.10.3	Meter Tamper Detection		
6.2.10.4	Automated Reading of Water Meters		
6.2.10.5	In-Home Energy Use Displays		
6.2.10.6	Demand Response / Load Management		
6.2.10.7	Prepayment Metering		
6.2.10.8	Remote Device Diagnostics and Maintenance Functionality		
6.2.10.9	Meter Configuration Management		
6.2.10.10	On-Demand Meter Reads		
6.2.10.11	Inter Master Control Computer Communications		
6.2.10.12	Check Meter Discrepancy Reporting		
6.3	Operational Requirements for AMI		
6.3.1	Expandability (Scalability) Requirements		
6.3.2	System Availability (Reliability) Requirements	--	--
6.3.2.1	General		
6.3.2.2	AMI Master Control Computer Availability		
6.3.2.3	Regional Collector Availability		
6.3.3	Maintainability	--	--
6.3.3.1	Revenue Meter Maintainability		
6.3.3.2	Regional Collector Maintainability		
6.3.4	Response Requirements	--	--
6.3.4.1	Revenue Meter Interrogation		
6.3.4.2	Man-Machine Interface Performance		
6.3.4.3	Disaster Recovery		
6.3.5	Spare Parts		

RFP Section	RFP Section Title	Bidder's Compliance	Reference(s) in Documentation
6.3.6	Special Provisioning and Diagnostic Tools		
6.3.7	Backup Interval Data Collection		
6.4	Documentation Requirements for AMI		
6.4.1	Quick Reference Guides		
6.4.2	Operating and Service Manuals		
6.4.3	Software User Manuals		
6.5	Staff Training Requirements for AMI		
6.6	AMI Acceptance Testing		
6.7	Other Requirements	--	--
6.7.1	Warranties	--	--
6.7.1.1	System Level Functional Warranty (12 months)		
6.7.1.2	Device Level Materials and Workmanship Warranty (5 years – declining share)		
6.7.1.3	Right to Operate Unsatisfactory Equipment		
6.7.1.4	Long Term Availability of Spare Parts		
6.7.2	Service Maintenance Support		
7.0	**Proposal**	**Noted**	--
7.1	Submittal	Noted	
7.2	Requirements	Noted	
7.3	Proposal Evaluation Criteria	Noted	
7.4	Selection Process	Noted	
7.5	Instructions and Conditions		
7.6	Debriefing of Unsuccessful Respondents	Noted	

Bidders shall also fill in the right-most column (i.e. References in Bidder's Documentation) with references to the location in submitted documentation (literature, user or maintenance manuals, etc.) where this feature is described in detail.

Note: Bidders should not underestimate or take lightly the importance that London Hydro places on vendor truthfulness and honesty in replying to this Table of Conformance. Bidders have ample opportunities to seek clarification (refer to Section 4.3, *Bidders Conference*, and Section 4.4, *Requests for Clarification or Additional Information*, herein) in instances where they may uncertain as to the interpretation or underlying intent of the stated requirements. If, based on prior knowledge, dialogue with references, or via other sources, the bid evaluation committee finds that a bidder has answered falsely, the bidder will be given an opportunity to explain the discrepancy, but

failing a very convincing explanation will have their proposal disqualified.

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D.3 Technical Information to be Included with Proposals

The information listed in the checklist below shall be included in the technical proposal binder:

- ☐ Measurement Canada's *Notice of Approval* reference for both the proposed energy meters and those that interoperate with the proposed AMI. Refer to Section 6.2.2 on page 41 herein.
- ☐ Description of antennae and transceiver technology and RF performance information, where a wireless LAN is offered. Also indicate availability of external system interfaces. Refer to Section 6.2.4.1 on page 43 herein.
- ☐ Ambient temperature range of AMCD. Refer to Section 6.2.4.3 on page 45 herein.
- ☐ Copy of RF certification document. Refer to Section 6.2.4.4 on page 45 herein.
- ☐ Comprehensive description of wireless mesh RF technology, performance metrics, and failover procedures, where a wireless LAN is offered. Refer to Section 6.2.5.1 on page 45 herein. This description shall also detail the sequence of events following the field replacement of a regional collector, i.e. does automatic node discover, optimized best-path routing, load balancing, etc. all occur automatically upon energization of the replacement regional collector, or require some level of user intervention? If user intervention is required, please elaborate.
- ☐ Comprehensive description of PLC or BPL technology, performance metrics, and failover procedures, where such a LAN is offered. Refer to Section 6.2.5.2 on page 47 herein.
- ☐ Identify variants of end device date tables. Refer to 6.2.6.2 on page 49 herein.
- ☐ Illustration and supporting description of "electronic security perimeter" scheme. Refer to Section 6.2.6.4 on page 49 herein.
- ☐ Photographs or brochures showing design of regional collector. Refer to Section 6.2.7.1 on page 51 herein.
- ☐ Comprehensive description of antennae / coupling device and transceiver technology for regional collectors, if applicable. Refer to Section 6.2.7.2 on page 51 herein.
- ☐ Capacity ratings on extended backup options (adder prices shall be shown in the costing sheets) for the regional collectors. Refer to Section 6.2.7.3 on page 51 herein.
- ☐ Ambient temperature range of regional collector. Refer to Section 6.2.7.4 on page 52 herein.
- ☐ Copies of certificate of compliance and TAC for regional collector. Refer to Section 6.2.7.5 on page 52 herein.
- ☐ Description of migration strategy for regional collector from initial WAN offering to WiMAX municipal wireless system. Refer to Section 6.2.7.6 on page 52 herein.
- ☐ A description of the bidder's implementations of CMEP and its variants, and a statement regarding interface upgrades in the event the IESO's Technical Interface Specification isn't finalized by the closing date for this project. Refer to Section 6.2.8.4 on page 54 herein.

- ☐ A description of the implementation of the "outage management system interface" function including mention of the interface method (refer to Section 6.2.8.5, *Integration with London Hydro's Corporate Computer Systems*, on page 56 herein) and calculated system response time. Refer to Section 6.2.9.2 on page 57 herein.
- ☐ A description of the implementation of the "quality of supply voltage reporting" function including mention of the interface method (refer to Section 6.2.8.5, *Integration with London Hydro's Corporate Computer Systems*, on page 56 herein). Refer to Section 6.2.9.3 on page 59 herein.
- ☐ A description of the implementation of the "bi-directional revenue meters" function including the NOA for the bidder's bi-directional meter. Refer to Section 6.2.9.4 on page 60 herein.
- ☐ A description of the implementation of the "meter phase registration failure detection" function. Refer to Section 6.2.9.5 on page 60 herein.
- ☐ A description of the implementation of the "remote disconnect of service" function. Refer to Section 6.2.10.2 on page 61 herein.
- ☐ A description of the implementation of the "meter tamper detection" function. Refer to Section 6.2.10.3 on page 61 herein.
- ☐ A complete description of the bidder's water meter transceiver unit (WMTU), if such a product offering is available. Refer to Section 6.2.10.4 on page 62 herein.
- ☐ Literature and product descriptions for in-home energy use displays, if available. Refer to Section 6.2.10.5 on page 63 herein.
- ☐ Identification of demand response / load management products supported by AMI system. Refer to Section 6.2.10.6 on page 64 herein.
- ☐ Literature and product descriptions for prepayment metering systems, if available. Refer to Section 6.2.10.7 on page 64 herein.
- ☐ Literature and product descriptions for "remote device diagnostics and maintenance" function, including specifications for an internal latching relay / switch meter accessory, if available. Refer to Section 6.2.10.8 on page 66 herein.
- ☐ Literature and product descriptions for "meter configuration management" function, if available. Refer to Section 6.2.10.9 on page 67 herein.
- ☐ Literature and product descriptions for "inter master control computer communications" function, if available. Refer to Section 6.2.10.11 on page 67 herein.
- ☐ Description of burn-in production tests carried out on regional collectors. Refer to Section 6.3.2.3 on page 70 herein.
- ☐ A recommended spare parts list. Refer to Section 6.3.5 on page 72 herein.
- ☐ Literature and product descriptions for the mobile provisioning and diagnostic tools. Refer to Section 6.3.6 on page 73 herein. If not included in the above, please indicate the overall time from the moment the Smart-meter is plugged into the meter socket (i.e. energized) until communications with the AMI master station is assured.

- ☐ A description of the backup method of obtaining interval data. Refer to Section 6.3.7 on page 74 herein.
- ☐ An overview of the proposed staff training program. Refer to Section 6.5 on page 75 herein.
- ☐ A description of the maintenance and support provisions. Refer to Section 6.7.2 on page 79 herein.
- ☐ Photographs or other depictions of the resin recycling symbols used on the meter components. Refer to Section 6.7.3 on page 79 herein.

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D.4 Other Technical Descriptions to be Included with Proposal

The information listed below shall be included in the proposal binder:

- ☐ For each of the Phase I application areas, described in Section 5.1.1 through to Section 5.1.8 herein, provide a simple schematic that illustrates the revenue meter to be used, and the communications strategy for data transfer to the Master Control Computer. The illustration shall indicate the quantity and locations of regional collectors, and signal injection equipment if required, etc.
- ☐ For one of the Phase I deployment areas, please describe the manner in which interoperability will be demonstrated – refer to Section 5.1 herein.

  Note: London Hydro recognizes that demonstrating interoperability will certainly require supply of a nominal number of revenue meters from other manufacturers that may be more expensive than the bidder's own brand. So as not to unfairly penalize bidders in the highly desirable demonstration of interoperability, evaluation of the AMI system's most probable cost will be carried out using revenue meter prices submitted for the bidder's own brand.
- ☐ Include a statement as to whether or not electric meters outside the scope of the Provincial AMI specification (refer to Section 6.1.7.2, *Revenue Meters beyond Scope of Provincial AMI Specification*, herein) can be accommodated by the proposed system. Are interfaces available for exporting the meter readings, etc to an MV-90 (or other) data collection system?
- ☐ Please describe the environments or service conditions that are most challenging for your proposed LAN technology. For those cases where the (wireless of BPL/PLC) LAN can't reliably communicate with one or more Smartmeters, what is the bidder's backup strategy (e.g. auxiliary intermediate communications devices, modified transceiver / coupler / antennae, etc.). Please provide literature and unit prices for such accessory devices. In the bidder's experience, how many of these devices might reasonably be anticipated for the Phase I and Phase II deployments?
- ☐ Please provide an organization chart showing the reporting structure for the project team (within the team itself, within the larger organization, and within the umbrella quality management system), the qualifications and experience of the individual team members, and the roles and responsibilities of each member of the project team. Also include a written description of the tools, techniques and methodology that will be used for successfully managing this project.
- ☐ Please provide a Gantt chart (or similar presentation tool) illustrating the milestones and activities for a Phase I Smartmeter deployment, using experience from similar projects (listed on Appendix D.6, *Reference List*) to guide estimation of duration of each activity.
- ☐ Please provide a written risk analysis (no more than 3 pages) that identifies potential risks which, in your experience, occur on projects of this type. Identify steps which can be taken to avoid or mitigate those problems; and steps to be taken should the problem occur. Incorporate activities in project plan (Gantt chart) to reduce the occurrence, severity and impact of events or situations which can compromise the attainment of any project objective. Your discussion should deal, at least in part, with the degree of increased risk associated with levels of software development and customization imposed by the

requirements, the degrees of increased risk through levels of use of non-commercially available software, the degree of reduced risk associated with the used of tools, techniques, and configurations similar to other existing, installed software, hardware, and network configurations.

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D.5 Price Proposal and Cost Elements

All bidders shall fill in the following pricing table. Where a particular function is included in the baseline product offering, use the text string "INCL" to indicate "no adder cost – functionality is included in baseline product". Where the baseline product does not provide or support a desired function, and the bidder is not interested or the technology is incapable of providing this function, use the text string "N/A" to indicate "no adder cost – functionality is not available and will not be provided".

Note: In several instances, bidders are requested to additionally provide volume pricing (i.e. the breakpoint, or volume at which additional price discounts apply, and the specific discount amount). It is intention of participants in the Smartmeter Purchasing Consortium (as previously described in Section 2.3 herein) that select the same bidder's solution to combine the volume requirements of individual LDC's to take advantage of the volume discounts (where individual Smartmeter deployment plans permit this strategy).

Advanced Metering Infrastructure Subsystem	**Unit Cost**	**Total Cost**
• **Master Control Computer Cost Elements**		
Cash allowance for BladeServers (refer to Section 6.2.8.1)		$ _____
Other hardware, if required; specify		$ _____
Software licensing (refer to Section 7.5.11)		$ _____
Allowance included for MDM/R interface (refer to Section 6.2.8.4)		$ _____
Adder for interface to OMS (refer to Section 6.2.9.2)		$ _____
Adder for supply voltage reporting (refer to Section 6.2.9.3)		$ _____
Adder for bi-directional meter support (refer to Section 6.2.9.4)		$ _____
Adder for meter phase registration failure (refer to Section 6.2.9.5)		$ _____
Adder for remote service disconnect (refer to Section 6.2.10.2)		$ _____
Adder for meter tamper detection (refer to Section 6.2.10.3)		$ _____
Adder for water meter AMR (refer to Section 6.2.10.4)		$ _____
Adder for in-home display support (refer to Section 6.2.10.5)		$ _____
Unit cost for in-home energy use displays (refer to Section 6.2.10.5)	$ _____	
Breakpoint costs for in-home energy use displays:		
• On quantities greater than _____ displays → $_____		
Adder for DR/LM application (refer to Section 6.2.10.6)		$ _____
Adder for prepay metering application (refer to Section 6.2.10.7)		$ _____
Unit cost for customer interface unit (refer to Section 6.2.10.5)	$ _____	
Breakpoint costs for customer interface units (CIU's):		
• On quantities greater than _____ CIU's → $_____		
Adder for remote diagnostics (refer to Section 6.2.10.8)		$ _____

Advanced Metering Infrastructure Subsystem	Unit Cost	Total Cost
Adder for meter configuration management (refer to Section 6.2.10.9)		$ _____
Adder for on-demand read functionality (refer to Section 6.2.10.10)		$ _____
Adder for inter-MCC communications (refer to Section 6.2.10.11)		$ _____
Adder for check meter reporting (refer to Section 6.2.10.12)		$ _____
Other software licenses, if required; specify		$ _____
• **Communications System Cost Elements**		
Regional collectors; based on quantities required for Phase I	$_____	$ _____
Breakpoint costs for Adv'd Metering Regional Collectors (AMRC's):		
• On quantities greater than _____ AMRC's → $_____		
• On quantities greater than _____ AMRC's → $_____		
Note: Presumably volume discounts apply for large order quantities. London Hydro has no knowledge of each manufacturer's economic breakpoints, and so we are asking the manufacturer to define the order quantities beyond which a lower unit price would apply.		
Adder for extended backup capacity (refer to Section 6.2.7.3)	$_____	
Adder for adapter to WiMAX WAN (refer to Section 6.2.7.6)	$_____	
Adder for adapter to fiberoptic WAN	$_____	
Other devices (repeaters, signal injectors); as required; specify	$_____	$ _____
• **Revenue Meter Cost Elements**		
Single-phase energy meters; unsealed; based on quantity in Table 5-2	$_____	
Single-phase energy meters; sealed; based on quantity in Table 5-2	$_____	
Breakpoint costs for sealed single-phase energy meters:		
• On quantities greater than _____ meters → $_____		
• On quantities greater than _____ meters → $_____		
Note: Presumably volume discounts apply for large order quantities. London Hydro has no knowledge of each manufacturer's economic breakpoints, and so we are asking the manufacturer to define the order quantities beyond which a lower unit price would apply.		
Adder for under-glass remote disconnect / reconnect feature	$_____	
Adder for prepayment meter (if available)	$_____	
Network energy meters; unsealed; based on quantity in Table 5-2	$_____	
Network energy meters; sealed; based on quantity in Table 5-2	$_____	
Breakpoint costs for sealed network energy meters:		
• On quantities greater than _____ meters → $_____		
• On quantities greater than _____ meters → $_____		
Adder for under-glass remote disconnect / reconnect feature	$_____	
Adder for prepayment meter (if available)	$_____	

Advanced Metering Infrastructure Subsystem	Unit Cost	Total Cost
Polyphase energy meters; unsealed; based on quantity in Table 5-2	$ _____	
Polyphase energy meters; sealed; based on quantity in Table 5-2	$ _____	
Breakpoint costs for sealed polyphase energy meters:		
• On quantities greater than _____ meters → $_____		
• On quantities greater than _____ meters → $_____		
Unit pricing on out-of-scope revenue meters (refer to Section 6.1.7.2):		
• Bi-directional energy meters; sealed; based on quantities of 5	$ _____	
• Single-phase, Xfmr-rated, combination meters; sealed; qty of 5	$ _____	
• Three-phase, Xfmr-rated, combination meters; sealed; qty of 25	$ _____	
• **Water Meter Transceiver Unit (WMTU) Cost Elements**		
WMTU's; based on quantity in Table 5-2	$ _____	
Breakpoint costs for water meter transceiver units:		
• On quantities greater than _____ WMTU's → $_____		
• On quantities greater than _____ WMTU's → $_____		
• **Other Project Cost Elements**		
Project Management (lot)		$ _____
Allowance for contract negotiations & SOW development		$ _____
Allowance for testing data exchange with provincial MDM/R		$ _____
System Documentation (refer to Section 6.4), lot		$ _____
Spare Parts (refer to Section 6.3.5), lot		$ _____
Mobile Provisioning / Diagnostic tools (refer to Section 6.3.6), lot		$ _____
Staff Training (refer to Section 6.5), lot		$ _____
Other elements; specify		$ _____
• **Miscellaneous**		
Annual maintenance contract beyond Phase I (refer to Section 6.7.2)		$ _____
Labour cost of experienced & qualified labour (refer to Section 5.3)	$ _____	
Vendor-hosted master control computer (initial set-up fee)		$ _____
Vendor-hosted master control computer (recurring annual fees)	$ _____	
• **Public Carrier WAN Charges (if part of Bidder's solution)**		
Activation charges, per regional collector	$ _____	
Annual tariff, per meter or regional collector (specify)	$ _____	
Illustrative examples (based on bidder's traffic model):		

Advanced Metering Infrastructure Subsystem	Unit Cost	Total Cost
• Annual lease costs for Phase I deployments listed in Section 5.1.1	$_____	
• Annual lease costs for Phase I deployments listed in Section 5.1.2	$_____	
• Annual lease costs for Phase I deployments listed in Section 5.1.3	$_____	
• Annual lease costs for Phase I deployments listed in Section 5.1.4	$_____	
• Annual lease costs for Phase I deployments listed in Section 5.1.5	$_____	
• Annual lease costs for Phase I deployments listed in Section 5.1.6	$_____	
• Annual lease costs for Phase I deployments listed in Section 5.1.7	$_____	
• Annual lease costs for Phase II deployments listed in Section 5.2.1	$_____	
• Annual lease costs for Phase II deployments listed in Section 5.2.2	$_____	
• Annual lease costs for Phase II deployments listed in Section 5.2.3	$_____	
• Annual lease costs for Phase II deployments listed in Section 5.2.4	$_____	
• Annual lease costs for Phase II deployments listed in Section 5.2.5	$_____	
• Annual lease costs for Phase II deployments listed in Section 5.2.6	$_____	
Total Annual WAN Lease Costs (for Phase I & II):	$_____	

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D.6 Reference List

Please provide at three (3) references where Advanced Metering Infrastructure (AMI) similar to the proposed system was provided by the bidder's firm:

Reference Utility #1:

Contact Name: Telephone:

Address:

City, Province / State, Postal Code / ZIP:

Date of Installation:

Type of Equipment Provided:

Reference Utility #2:

Contact Name: Telephone:

Address:

City, Province / State, Postal Code / ZIP:

Date of Installation:

Type of Equipment Provided:

Reference Utility #3:

Contact Name: Telephone:

Address:

City, Province / State, Postal Code / ZIP:

Date of Installation:

Type of Equipment Provided:

D.7 Bidder's Corporate Information

London Hydro is interested in ensuring that the enterprise that supplies its AMI system has the financial stability and management leadership, focus on profitability and distinctive strategies to survive and thrive in the future marketplace. London Hydro requires the information listed following to make an assessment:

- Profile of the company – Give a brief description of the company including a copy of the company registration documents.

- Details of years in the business – Give a description of the number of years experience in the relevant line of business.

- Quality assurance – List the internationally recognized Quality Assurance Certificates held by the company, and include copies of the listed certificates.

- Financial Soundness – Provide the following information:
  - An annual report for the current and previous two years;
  - Audited financial statements for the current and previous two years (financial statements that apply to divisions are adequate for conglomerates); and

    Note: If independently audited financial statements do not exist for the bidder's firm, the bidder shall state the reason and instead submit sufficient information to enable the evaluation panel to determine the financial stability of the bidder.

  - A copy of the most recent credit rating agency (e.g. S&P, B&D, etc.) report.

  Note: London Hydro recognizes the sensitive nature of such financial information and will take all reasonable measures to ensure that its disclosure is limited to the bid evaluation team.

Failure to provide all the above mentioned information may result in the bid being rejected. Bids that are unclear or leave room for interpretation will be considered non-responsive and will not be evaluated.

D.8 Bidder's Consent to Limited Disclosure of Information

Background:

As previously noted in Section 2.2, *Local Context for Project*, London Hydro is assuming a lead role in the procurement of Advanced Metering Infrastructure (AMI) for installation and operation within its franchise service territory. Also, and as previously noted in Section 2.3, *Informal Regional Smart-Meter Purchasing Consortium*, the named LDC's will participate in the evaluation of proposals, and may opt to independently procure (from the same or a different bidder) AMI for installation and operation within their respective franchise service territories.

Furthermore, Subsection 2 Paragraph 4 of Ontario Regulation 153/07 (which amends Ontario Regulation 427/06), *Smart Meters: Discretionary Metering Activity and Procurement Principles*, compels LDC's to provide to the Ministry of Energy or the Ontario Energy Board information related to the procurement of AMI.

Consent:

I/We hereby consent to the disclosure of our Submission to the RFP, whether of a confidential nature or not, for the purpose of:

- Making copies of the Submission or accompanying documentation by London Hydro or named members of the Smart meter consortium for the purpose of this RFP process;
- Retention of information in the Submission by London Hydro or the named members of the Smart meter consortium;
- Public disclosure of the name of a Respondent;
- Disclosure of the Submission and any part thereof to any consultants or persons for the purpose of evaluating the information or assisting the members of London Hydro and named members of the Smart meter consortium with respect to this RFP process, including the evaluation team; and
- Disclosure of the Submission and any related information received from the Respondent arising from this RFP process, to the Ministry of Energy and to the Ontario Energy Board for their respective purposes, including the furtherance of the Smart Metering Initiative.

Signature of Witness	Signature of Respondent's Representative
Name of Witness	Name and Title
Date of Signature	Date of Signature

I have authority to bind the Respondent

Appendix E

Standard Contract Terms & Conditions

E.1 London Hydro's standard contract terms & conditions

London Hydro Inc

STANDARD CLAUSES INCLUDED IN TENDERS

RIGHT TO ACCEPT OR REJECT TENDER

London Hydro reserves the right to reject any and all tenders, the right to accept other than the lowest bidder, and also the right to not accept any bid.

London Hydro reserves the right to cancel this Request for Tender, at any time without penalty or cost.

It is recognized that the acceptance or awarding of a bid for the benefit of London Hydro may require authorization by the London Hydro Board of Directors, which has the sole discretion of accepting or rejecting any bid for London Hydro's benefit.

PERFORMANCE

London Hydro has the right to immediately cancel the Contract before the expiration of term and select a different bidder if there is non-compliance with any laws, rules or regulations of Ontario, or any of the terms outlined in this Request for Tender.

If the quality of product or service is unsatisfactory or the Contractor fails to comply with London Hydro's requirements, London Hydro shall notify the Contractor in writing (e-mail accepted) of the problem and the Contractor shall respond and correct the problem within twenty-four (24) hours or provide a plan to rectify the problem. The terms of the plan must be agreed upon by London Hydro to constitute its acceptance. Failure to comply with the above may result in termination of the Contract.

TENDER RESPONSE

Any variation(s) from the information contained in this proposal must be noted on this document. Tenders may include attachments to expand on your service or product. London Hydro reserves the right to contact bidders for submission clarification purposes during the evaluation process.

The person signing this application shall initial erasures, overwriting or strikeouts.

Failure to provide response to all the information asked for may cause the response to be declared "incomplete". Incomplete responses, unless they are to the advantage of London Hydro, will be disqualified.

Your signature of authorization and acceptance of this document is placed herein. This implies you have read, fully understood and agree to abide by all information contained within this document.

This Request for Tender and the resulting submissions should not be considered a commitment by London Hydro to enter into any contract. As stated elsewhere in this Request, London Hydro reserves the right to reject any and all submissions.

London Hydro will not be responsible for any cost, expense, liability, loss or damage incurred or suffered by a Bidder because of acceptance or rejection of any tender, delay in acceptance of a tender, or non-award of contract.

DELIVERY

DELIVERY IS THE SOLE RESPONSIBILITY OF THE RESPONDENT. TENDERS MUST BE HAND DELIVERED TO THE EXECUTIVE OFFICE NOTED ABOVE TO ENSURE RECEIPT BY THE CLOSING TIME. TENDERS RECEIVED AFTER THE CLOSING TIME WILL BE REJECTED AND RETURNED TO THE BIDDER UNOPENED.

A contractor who has already submitted a tender may submit a further tender at any time up to the official closing time. The last tender received shall supersede and invalidate all tenders previously submitted by that contractor as it applies to this request for tenders.

DISCOUNTS

Please advise what discounts are available for quantity volumes or early payment. Specifically, what discounts are offered for payment within 10 days of receipt of invoice.

RELEASE OF INFORMATION

Respondents to this Request for Tender are advised that information obtained from respondents would be communicated to the public and the respondents in the following manner and form:

- A public opening of the tenders will take place at the time and location indicated in the attached tender cover letter. All respondents and the general public may attend this public opening of the respondents' submissions. At such opening, information communicated will be limited to the names of the participating respondents and the bid amounts. No other information will be provided to the public at that time. Evaluation and awarding of the contract will not take place at the public opening.
- After the tenders have been evaluated, a recommendation to award the contract will be presented to London Hydro's Executive or the Board of Directors for approval. The information presented will consist of the respondent's names, the bid amounts and the recommendation to award the contract.
- After the evaluation and awarding of the contract, all unsuccessful respondents will be advised in writing that the contract was not awarded to them.
- Further requests for information from those respondents who have submitted pricing for this Tender must be received in writing to the attention of the Purchasing Coordinator. Facsimile will be acceptable if signed and the originating facsimile is identified and consistent with the party requesting the information. Electronic E-mail requests will also be accepted. Information provided would be limited to the names of the respondents, the name of the successful bidder and the range of the prices received from the respondents.

Municipal Freedom of Information and Protection of Privacy Act (MFIPPA) – PERSONAL INFORMATION PROTECTION

While performing its services for London Hydro, the Contractor may come into contact with personal information regarding London Hydro's customers, employees or other parties. Such personal information is subject to the requirements of privacy legislation and London Hydro's privacy policy.

The Contractor may not use or disclose such personal information in any way except pursuant to London Hydro's instructions or to the extent necessary to perform its services for London Hydro. The Contractor must use security measures adequate to the sensitivity of the personal information to prevent the unauthorized use and disclosure of personal information both to and by third parties and to and by the employees of the Contractor who have no need to view personal information for the performance of the Contractor's services for London Hydro.

The Contractor must promptly notify London Hydro of any requests for disclosure of personal information by any party and of any accidental or unauthorized access to such information. If the Contractor subcontracts any part of its obligations hereunder it must obtain contractual obligations similar to this letter from the subcontractor.

CONFLICT OF INTEREST AND COLLUSION

The following shall be part of tender response:

I/We declare that no person, firm, or corporation, other than the one whose signature, or the signature of whose proper officers and seal are attached below, has any interest in this bid. I/We further declare that this bid is made without any connection, knowledge, or comparison of figures; or arrangement with any other company, firm or person making a bid for the same, and is in all respects fair and without collusion. I/We declare that no employee(s) of London Hydro is, or will become interested, directly or indirectly as a contracting party or otherwise in the supplies, work or business to which it relates or any portion of the revenues or profits thereof, or in any of the monies to be derived there from. I/We further declare that the several matters and representations stated in said bid are in all respects true.

Please complete the following information:

Company Name: _____

Business License #: _____

GST #: _____

Authorized Signature: _____

Name (Printed): _____

Date: _____

RE: ENGINEERING TENDERS WITH PERFORMANCE BONDS & HOLDBACKS:

HOLD BACK RELEASE

The Contractor is advised that forty-five days after the date of Substantial Completion, the Contractor, on production of WSIB Clearance Certificate and a sworn statement (CCDC Form 9A – 2001 Statutory Declaration) that all accounts for labour, subcontracts, products, construction machinery and equipment, and other indebtedness incorporated in the work that London Hydro may in any way be held responsible for have been fully paid, London Hydro shall issue a certificate for payment of the hold back amount. London Hydro shall retain amounts properly retained as a holdback or as identified in dispute.

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